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SPINAL CORD INJURY REHABILITATION EVIDENCE

Epidemiology of Traumatic SCI

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Abbreviations

ASIA	American Spinal Injury Association
ATSCI	acute traumatic spinal cord injury
CIREN	Crash Injury Research Engineering Network
CSCI	cervical spinal cord injury
ICU	intensive care unit
MST	major spinal trauma
MVC	motor vehicle crashes
NASS-CDS	National Automotive Sampling System's Crashworthiness Data System
SI	spinal injury
TSCI	traumatic spinal cord injury

Epidemiology of Traumatic SCI

1.0 Introduction

Quantifying diseases or health conditions in populations is a core domain in epidemiology. In addition, measuring health status can facilitate the understanding of the impact of healthcare management strategies and health policies.

Measuring disease frequency in populations requires stipulation of diagnostic criteria or case definition. For the purpose of this review, traumatic spinal cord injury (SCI) is defined as a lesion of traumatic nature within the spinal cord that results in the disruption of nerve fibre bundles that convey ascending sensory and descending motor information (Raineteau and Schwab 2001; Kraus et al. 1975).

We systematically reviewed the literature with respect to the estimations of incidence, prevalence, and etiology of traumatic SCI in different countries worldwide and distinctive time periods. This review provides up to date knowledge of the global incidence and prevalence, and cause related data of traumatic SCI for clinical and policy comparisons.

The methods used for the development of this epidemiological review deviates from the traditional SCIRE methods (see the SCIRE Methods section) that primarily focus on studies testing an intervention or evaluating the psychometric properties of an outcome measure. Specifically, this chapter includes only original articles that properly estimate the incidence, prevalence, or causes of traumatic SCI among adults (≥18 years). Case reports, editorial articles and meeting abstracts were excluded.

2.0 Systematic Review

Table 1: Systematic Review of Epidemiology

Authors; Country Date included in the review Number of articles Level of Evidence Type of Study Score	**Method Databases**	**Conclusions**
Van den Berg et al. 2010 Reviewed articles published from January 1997 to December 2008 N=13 **Level of evidence:** N/A **Type of study:** Epidemiological (retrospective n=11; prospective n=2) AMSTAR: 5	**Method**: Review of original articles that estimated the incidence rate of SCI worldwide. **Database**: PubMed and EMBASE	1. In Western Europe, crude incidence ranged from 12.1 (Netherlands) to 57.8 (Coimbra, Portugal) per million. 2. In North America, studies revealed annual rates between 25.2 and 52.5 per million. 3. Incidence rates of 18.8, 12.7, and 16.9 per million were reported in Taiwan, southeast Turkey and Australia, respectively. 4. Three age groups were found to have a higher incidence of SCI: 15-29, 40-49, and ≥50 years of age. 5. Higher incidence of SCI in males with ratios ranging from 2:1 in Turkey to 6.7:1 in Ireland for traumatic injuries and a lower ratio of 1.3:1 for non-traumatic SCI in Australia. 6. The largest cause of SCI was motor vehicle collisions.

Authors; Country Date included in the review Number of articles Level of Evidence Type of Study Score	**Method Databases**	**Conclusions**
Ning et al. 2012 Review of published articles from January 1980 to December 2011 N=39 **Level of Evidence:** N/A **Type of study:** Epidemiological (retrospective n=35; prospective n=4) AMSTAR: 4	**Methods**: Review of original articles that estimated either incidence and/or prevalence of traumatic SCI in Asia **Databases**: PubMed, EBSCO, MEDLINE, EMBASE, and Google Scholar	1. Among studies conducted in East, Southeast, and West Asia, incidence rates ranged from 12.06 per million (Anatolia, Turkey) to 61.6 per million (Taiwan). 2. Injury ratios between men and women ranged from 0.99:1(Taipei, Taiwan) to 13.5:1 in India. 3. Most common causes of injury were motor vehicle collisions (59.5%) and falls (37.8%).
Cripps et al. 2011 Reviewed published articles prior to 2011 N= 73 **Level of Evidence:** N/A **Type of study:** Epidemiological primarily AMSTAR: 3	**Methods**: Reviewed published articles which estimated the incidence and prevalence rates of SCI worldwide. Replicated search of Wyndaele 2006 without date and language restriction using search phrases (exploded). **Databases**: MEDLINE and EMBASE	1. Incidence rate was 39, 15, and 16 per million in North America, Western Europe, and Australia, respectively. 2. Prevalence rates in South and Southeast Asia were available for India and Vietnam with 236 and 464 per million, respectively. 3. Prevalence rates in Australasia were estimated for Australia and were 370 (1987), 681 (1997), and 540 (1998). 4. Prevalence rates in Western European countries of Finland, Iceland, and Norway were 280 (1999), 316 (1973-1989), and 365 (2002) per million respectively. 5. Prevalence in Canada was estimated at 1173 per million (2001-2002). 6. Prevalence reported for the US (1935- 2006) ranged between 473 and 1009 per million 7. Common causes of SCI reported worldwide were road traffic accidents, falls, and violence. 8. Violence/self-harm was higher in North America (15%) than either Western Europe (6%) or Australia (2%). 9. Sub-saharan Africa has the highest reported violence-related TSCI in the world (38%), followed by north Africa/Middle East (24%), and Latin America (22%).
Furlan et al. 2013 Review of articles published from 1950 (MEDLINE) or 1980 (the other databases) to December 1, 2012 N=73 **Level of evidence:** N/A	**Method**: Review of original articles that estimated either incidence and/or prevalence of traumatic SCI among adults worldwide **Database**: MEDLINE, EMBASE, CINAHL, PSYCHINFO, and Cochrane databases.	1. In the Americas, the incidence rate of traumatic SCI varied from 20.7 to 83.0 people per million inhabitants a year (most recent studies). 2. In Europe, the estimated incidence rate varied from 8.0 in Spain to 130.6 individuals with traumatic SCI per million inhabitants per year in Bulgaria. 3. Among countries and cities located in Asia , the lowest incidence rate was 14.6 in Taipei, Taiwan (1978-1981) and the highest (1998-

Authors; Country Date included in the review Number of articles Level of Evidence Type of Study Score	**Method Databases**	**Conclusions**
Type of study: Epidemiological AMSTAR**:** 2		2008) with 246.0 people per million per year in all of Taiwan 4. In Oceania, the estimated incidence rate varied from 10.0 (Fiji) to 77.0 (New Zealand) per million per year 5. The prevalence worldwide varied from 50 to 1, 298 cases per million.
Ackery et al. 2004 Reviewed published articles between 1993 and November 2003 N= 41 **Level of Evidence:** N/A **Type of study:** Epidemiological primarily AMSTAR: 1	**Methods**: Reviewed published articles on the epidemiology of SCI worldwide. **Database**: PubMed	1. In Western Canada, Portugal, Italy, Japan, the Russian Federation, and Australia, incidence rates were 52.5, 57.8, 18-20, 39.4, 29.7, and 14.5 respectively. 2. Mean age ranged from between 15-24 to 55.4 years of age 3. The ratio male/female ranged from 2.5:1 to 8.1:1
Hagen et al. 2012 Reviewed articles published prior to April 1, 2011 N=147 **Level of evidence:** N/A **Type of study:** Epidemiological AMSTAR**:** 0	**Method**: Reviewed published articles which estimated the incidence and prevalence rates of SCI worldwide. **Database**: PubMed	1. Annual incidence rates (1947- 2008) ranged from 2.3 (Canada and Western Europe) to 83 (Alaska) per million worldwide. 2. Prevalence rates ranged from 236 (India) to 1800 (US) per million. 3. Average age at the time of injury worldwide varied from 26.8 years (Turkey) to 55.5 years (USA). 4. Overall, SCI occurred more often in men in countries other than Iran and Taiwan where the frequencies of SCI was equal among both genders. 5. Common causes of SCI in decreasing order included traffic accidents, falls, violence, and sports accidents.
Chiu et al. 2010 Reviewed published articles from 1989 to 2009 N=18 **Level of Evidence:** N/A **Type of study:** Epidemiological AMSTAR: 0	**Methods**: Reviewed published articles reporting on traumatic SCI epidemiological data **Databases**: PubMed and MEDLINE	1. Among developed countries incidence rates decreased from 52.2 to 13.1 (1976- 2005) 2. Among developing countries, the incidence rates ranged from 12.7 to 29.7 per million. 3. Average age in developed countries ranged from 30.7 to 48.5 years and between 40 and 50 years in the majority of studies conducted in developing countries. 4. First and second most common causes in developed countries were traffic accidents and falls respectively. However falls was the main cause of SCI in developing countries.

Authors; Country Date included in the review Number of articles Level of Evidence Type of Study Score	Method Databases	Conclusions
Wyndaele M & Wyndaele J-J. 2006 Reviewed published articles from 1995 to present N=19 **Level of evidence:** N/A **Type of study:** Epidemiological AMSTAR: 0	**Method**: Reviewed published articles which estimated the incidence and prevalence rates of SCI worldwide. **Database**: PubMed.	1. Prevalence rates in Australia (1997), Finland (1999), USA (2001), and USA (2005) were estimated to be 681, 280, 700, and 755 per million respectively. 2. In Europe (Turkey, Russia, Portugal, The Netherlands, and France) incidence rates ranged from 10.4 to 29.7 per million. 3. In North America (Alaska, Mississippi, Kentucky, Indiana, Ontario, and Alberta), incidence rates ranged from 27.1 to 83 per million. 4. In Asia (Jordan, Japan, Taiwan, and Fiji Islands), incidence rates ranged from 18.0 to 40.2 per million. 5. In Australia, the crude SCI incidence (1997) was 16.8 per million per year. 6. On average the incidence of SCI worldwide (1977 to 2005) ranged from 29.5 to 34.4 with a higher average reported for the period of 1975-1995. 7. The average age at injury was 28.7 yrs from 1973 to 1979, which has risen to 37.6 yrs in 2000. 8. The sex distribution (M/F) of SCI in recent studies is 3.8/1, where it used to be 4.8/1.

3.0 Incidence and Prevalence of SCI by continent and country

The primary online search yielded 1,538 article titles, and the secondary search through reference lists of retrieved articles captured 9 additional articles. Overall, 67 articles fulfilled the inclusion and exclusion criteria for incidence studies (tables 2-5) and 12 articles for prevalence studies (table 6).

3.1 Incidence of SCI

Incidence is the proportion of a population initially free of the condition that develops it over a given period of time. In our review, incidence is standardized as the number of cases of traumatic SCI per million inhabitants a year. Tables 2 to 5 present the incidence of traumatic SCI by geographic area.

Table 2: Incidence in the Americas
Table 3: Incidence in Europe
Table 4: Incidence in Asia
Table 5: Incidence in Oceania

Discussion

In North America, the incidence of traumatic SCI varied from 17 to 83 people per million inhabitants a year in the most recent studies; incident cases in the US military was considerably higher at 429 per million. The vast majority of the studies are based on Canadian (n=8) or American data (n=15).

In Europe, the estimated incidence varied from 3.3 to 130.6 individuals with traumatic SCI per million inhabitants a year. This reflects the experience of several countries including Bulgaria, Denmark, Finland, France, Germany, Iceland, Ireland, Italy, Norway, Portugal, Romania, Spain, The Netherlands, Estonia and Turkey.

In Asia, the incidence of traumatic SCI was reported between 6.7 and 246 persons per million inhabitants a year. There were 5 Taiwanese studies, 3 Japanese studies, 2 Chinese studies, 1 Russian and 1 Jordanian study.

In Oceania, the estimated incidence varied from 5.6 to 49.1 individuals with traumatic SCI per million inhabitants a year. There were 3 Australian studies, 12 from New Zealand and 1 from Fiji.

Our search did not capture any study focused on incidence or prevalence in an African country.

Time trends in SCI incidence

Of the 67 articles on incidence, 19 studies provided estimated incidence rates of traumatic SCI in at least 2 different periods of time. Most of those studies suggested an increasing incidence of traumatic SCI over the last decades, but three articles in Canada, Taiwan, and Australia reported a decreasing incidence. Interestingly, an updated analysis from Iceland found that while incidence appears to have dropped between the late 70's and 90's, it has returned to past levels in the late 00's.

The most recent analysis from Canada found that in British Columbia, the incidence of SCI decreased from 42.2 to 32.5 per million between 1995 and 2004 (Lenehan et al, 2012). Pickett et al. (2006) found that the incidence of traumatic SCI in London (Ontario, Canada) increased from 21 to 49 people per million inhabitants a year between 1997 and 2000. Similarly, Starr-Bocian (1991) reported that the SCI incidence in Colorado (USA) increased from 26.5 to 38.8 individuals per million inhabitants a year between 1986 and 1990. Based on a broader time series from Olmsted County (Minnesota, USA), Griffin and Opitz (1985) also found considerable increase in the SCI incidence from 22.2 people per million inhabitants a year between 1935 and 1944 to 70.8 people per million inhabitants a year between 1975 and 1981. In a Finnish study (Kannus et al. 2007), the incidence of traumatic SCI more than doubled from 52 individuals per million inhabitants in 1970 to 120 in 2004. Similarly, Maharaj (1996) documented a significant increase in the SCI incidence in Fiji from 5.6 to 17.9 people per million inhabitants a year between 1986 and 1991. In the most recent study, Hagen et al. (2009) documented an increase in the incidence of traumatic SCI from 6.2 to 26.3 individuals per million a year from the 1950s to the 1990s in Western Norway.

Differently, Chen et al. (1997) reported a reduction in the SCI incidence in Taiwan from 24.5 to 17.2 individuals per million a year between 1993 and 1996. Yeo (1993) also found a decreasing incidence of traumatic SCI in New South Wales (Australia) from 21.6 people per million inhabitants a year in 1987 to 15.6 individuals per million inhabitants a year in 1992. Similarly, Knutsdottir (1993) reported a decrease in the incidence of traumatic SCI in Iceland from 24 in the 1970s to 18 people per million a year in the 1980s.

3.2 Prevalence of SCI

Prevalence is the proportion of a group of individuals having a health condition at a given point in time. In our review, prevalence is expressed as the number of cases of traumatic SCI per million in a given year. Table 6 presents the prevalence of traumatic SCI by geographic area.

Table 6: Prevalence by Country

Discussion

There are 12 studies that provided estimates of prevalence of traumatic SCI varying from 50 to 1,298 cases per million worldwide. There are regional differences of traumatic SCI across the globe, but generally, the trend is towards increasing prevalence over the last decades.

In Canada, the estimated prevalence of SCI is 1,298 per million, the highest of any prevalence estimate to date. In different regions within the United States, the estimated prevalence varied from 50

to 906 individuals with traumatic SCI per million. In Sweden and Finland, the prevalence of traumatic SCI was estimated to be 227 and 280 individuals per million, respectively. Based on data from India, the prevalence of traumatic SCI was reported to be 236 cases per million (Razdan et al. 1994), while in Australia, O'Connor et al. (2005) documented a prevalence of 681 individuals with traumatic SCI per million. In more recent studies, Correa et al. (2011) documented 112 cases per million in Chile, and Hagen et al. (2010) reported 35.1 to 41.9 cases per 100,000 in Norway. Knutsdottir et al. (2012) estimated the prevalence in Iceland to be 526 per million.

In one study reporting the prevalence of SCI at two or more time points from the United States, the results indicate an increasing prevalence of traumatic SCI. Griffin and O'Fallon (1985) reported an increase in the prevalence of traumatic SCI in Olmsted County (Minnesota, USA) from 197 to 473 cases per million population between the 1950s and 1980s.

3.3 Summary - Incidence and Prevalence

The results of our systematic review suggest a relatively broad variation of incidence and prevalence of traumatic SCI among distinctive geographic regions. While most of the prior studies indicated an increasing incidence of traumatic SCI over the last decades, a few reports suggested trends towards reduction of its incidence over the past years. Furthermore, prior studies consistently suggested an increasing prevalence of traumatic SCI over the past few decades (Griffin and Opitz 1985; Starr-Bocian 1991; Maharaj 1996; Pickett et al. 2003). Those differences can be partially attributed to methodological divergences or limitations, such as the use of national databases versus hospital databases or regional chart reviews or surveys. Discrepancies among the results can also be associated with country-related differences regarding social-economic or cultural factors, public health and prevention policies, and healthcare systems all of which can influence occurrence and survival and thus the prevalence of traumatic SCI.

In our review, Europe and Asia (i.e. continents with more heterogeneous populations) showed a greater range of incidence in comparison with Oceania and the Americas, which are essentially represented by Australia, Canada and the United States. One may speculate that diversity of societies, economies, healthcare systems and public health policies in Europe and Asia amplifies differences regarding health status including traumatic SCI. In addition to this contextualization, there are potential methodological issues and limitations with regard to data collection and quality. The paucity of validation studies of registries and databases is alarming and suggests caution when comparing derived results. For instance, under-ascertainment and misclassification of cases is a major methodological issues in studies focused on incidence and prevalence of any health condition.

Our review also indicates that the incidence of traumatic SCI increased in Canada, the United States, Finland, Fiji and Norway, whereas they reduced in Taiwan, Iceland and New South Wales. Again, methodological considerations should be taken prior to interpreting those discrepancies. Further studies are required to confirm those trends and, more importantly, to determine the reasons for such differences which may be applied to improve the survival and health status of people with SCI in other countries.

The prevalence studies in our review suggest that the number of people with traumatic SCI can greatly vary depending upon the geographic region. Again, underestimation of the numerator may play a key role in the lower prevalence reported in some of those previous studies. Improvement of economics, quality of life and healthcare apparatus actually contributed to an increased life span of person with traumatic SCI as documented in previous studies (DeVivo et al. 1999; Strauss et al. 2006). Therefore, a boost in the prevalence can at least partially be explained by an increase in the individuals' life span after a traumatic SCI. However, prevalence could also be amplified by a real increase in the incidence of traumatic SCI as heralded in a number of those studies.

The results of this review indicate differences among geographic regions regarding the incidence and prevalence of traumatic SCI. Also, an increase in the incidence and prevalence of traumatic SCI has been reported in several countries worldwide. However, this comprehensive review of the literature also emphasizes the need for further studies on incidence and prevalence of traumatic SCI. A better understanding of the reasons for the discrepancies in the incidence and prevalence among those geographic regions may inform effective strategies to reduce the global burden of this disabling health condition.

4.0 Frequency of SCI by Cause

It is well established that using safe practices at work and at play can prevent many SCIs. Although significant efforts have been made towards the prevention of SCI, the efforts can still be improved by identifying and studying the various causes of SCI in different settings.

In tables 7 through 14, we present a global perspective on the frequency of the leading causes of SCI including motor vehicle crashes (MVC), falls, sports, self harm, violence, work-related incidents, natural disasters, and other.

4.1 Motor Vehicle Crashes

There were 84 studies reporting on SCI as a result of motor vehicle crashes (MVC) (table 7). These studies presented statistics from 30 different countries; all continental regions were covered by at least one study. A variety of data sources were used including national and regional registries and national, regional or local hospital admission/discharge records or surveys. The studies used a variety of methods to collect and aggregate data. North America had the most studies (N=26), primarily from the United States (N=17 studies), followed by Europe (N=23 studies).

The proportion of SCI related to MVCs ranged from 6.9% in Nepal (Shresta et al. 2007) to 89% in Nigeria (Olasode et al. 2006). The most frequent proportion fell within the 40-49.9% range (N=22 studies) followed by the 30-39.9% range (N=19 studies). Differences in inclusion criteria may be one of the primary reasons for the wide variation of reported estimates as some studies included all causes of SCI while others excluded non-traumatic causes or other subgroups such as patients with neurodegenerative diseases, or individuals with or without neurological deficits.

In the United States and Canada, MVCs are the most common cause of SCI. Most recent estimates indicate MVCs account for 41% to 45% of SCIs in the United States (National Spinal Cord Injury Statistical Center February 2010; DeVivo and Chen 2011). In British Columbia, Alberta, and Manitoba Canada, MVCs are the primary cause of SCI (Lenehan et al 2012; Dryden et al. 2003; McCammon and Ethans 2011). Data from Manitoba indicated that the relative proportion of SCIs resulting from MVCs declined over time as indicated by decreasing frequencies among three different cohorts (47.4,%, 39.3%, 34.9%) sampled at three different time points between 1981 and 2007 (McCammon and Ethans 2011). Over this time, an increase in the frequency of females incurring a SCI due to MVCs was also observed (McCammon and Ethans 2011). Contrary to this, Pirouzmand (2010) reports an increase in relative frequencies of SCI due to MVCs from 1986 to 2006, in Toronto, Ontario, Canada, and Couris et al. (2010) report consistent frequencies from 2003 to 2006 in all of Ontario, Canada, with more women (28.5%) than men (23.0%) sustaining SCI.

Most recent estimates from Europe indicate MVCs to be the leading cause of SCIs in regions of Spain, Iceland and Turkey, and the second most common in regions of Norway. In Aragon, Spain, MVCs were the most common cause of SCI (57.0%) between 1972 and 2008, with higher incidence in males than females for all ages (Van Den Berg et al. 2011). Similarly, Cosar et al. (2010) report MVCs have accounted for 55.1% of SCIs among 127 individuals taking part in an in-patient rehabilitation program in Turkey between 1996 and 2008. In two counties in Norway, MVCs were found to be the second leading cause (34.2%) of SCI between 1952 and 2001. During this observation period MVCs

resulting in a SCI increased overall and specifically among younger (<30 years) males (Hagen et al. 2012).

In Asia, MVCs are the primary cause of SCI in Taiwan (58.8%) (Wu et al. 2011), Iran (52.0%) (Chabok et al. 2009), Saudi Arabia (85%) (Alshahri et al. 2012), India (45%) (Chhabra and Arora 2012) and in one study from China (Hua et al. 2013). Other studies from the region found that MVCs were the second leading cause of SCI, including in Beijing (22.3%) and other areas of China (Tianjin (34.1%; 36.4%) (Ning et al. 2011; Li et al. 2011; Wu et al. 2012) as well as Pakistan (32.0%) (Qureshi et al. 2010). Similar to other studies, MVCs leading to SCI were most common among young, males, with MVCs occurring due to fatigue with highway driving without the use of seatbelts (Ning et al. 2011).

Two papers with a specific focus on SCIs resulting from MVCs were found in the most recent update. One paper reporting on MVCs in the United States used both the Crash Injury Research Engineering Network (CIREN), and the National Automotive Sampling System's Crashworthiness Data System (NASS-CDS) databases (Stein et al. 2011). The CIREN database includes only newer fleet of vehicles and thus newer safety features, in addition to the reporting of significant injuries, whereas the NASS-CDS database represents a national probability sample of vehicles that are involved in any police-reported MVCs. The authors found that among the more serious MVCs as those included in the CIREN database, 11.5% of case occupants (n=3,524) had cervical spine injuries, whereas 0.35% of all occupants (N=48,660,000) in the NASS-CDS database sustained a cervical spine injury. Rollover and other severe crashes led to much higher risk of cervical spine injury. Older individuals (>65 years) were at an increase risk of cervical spine injury. Seat belt use was effective at preventing cervical spine injuries whereas airbag deployment may increase the risk of sustaining a cervical spine injury when in a serious MVC.

Lieutaud et al (2010) reported on data from an epidemiological database of every MVC requiring medical attention in health facilities in the Rhone area of France since 1995. From 1997 to 2006, 144 (0.15%) individuals suffered a SCI out of the 97,341 patients included in the database. Cervical SCIs were the most frequent type of injury. More motorcyclists sustained a SCI compared to other types of major spinal trauma. Being younger, male, a motorcyclist, and not wearing a seatbelt were identified as risk factors for SCI.

Table 7: Motor Vehicle Crash

4.2 Falls

There were 82 studies reporting data on falls leading to SCI (table 8). 40 studies used data arising from hospital admission/discharge records which included either single or multiple hospitals. A total of 14 studies were based on national data from specifically designed SCI databases. Most of the studies were conducted in North America (Canada N=8; United States N=18) and Europe (N=24) followed by studies conducted in countries in Asia (N=20), Africa (N=5), Oceania (N=6), and South America (N=1).

The proportion of fall-related SCI ranged from a low of 2.2% in Italy (Caldana and Lucca 1998) to a high of 77.6% in Nepal (Lakhey et al. 2005). Interestingly a large proportion of the high rate of falls reported in Nepal is due to the occupational hazard of working in trees. The most commonly reported proportion of fall-related SCI was in the 20-30% range (N=27 studies) followed by the range below 20% (N=16). One likely source of variation is due to the included age groups. Samples that included all age groups tended to have a lower proportion of fall-related SCI compared to those with older adults. Studies from Japan (Shingu et al. 1995; Shingu et al. 1994) and Romania (Soopramanien et al. 1994) had higher proportions of fall-related SCI compared to other countries. The mean age of subjects in these studies tended to be older (about 40 years or more) than in the other studies.

Most recent estimates from the United States indicate falls as the second leading cause of SCI, varying from 24.5% to 27.3% (National Spinal Cord Injury Statistical Center February 2010; DeVivo and Chen 2011), and the leading cause of SCI among individuals 45 years of age and older (DeVivo and Chen 2011). In 3 studies from Canada, falls were the leading cause of SCI in one study (49.5%) (Couris et al. 2010), and the second leading cause in the other studies (16.4%; 21.2%; 28.5%) (Pirouzmand 2010; McCammon and Ethans 2011; Lenehan et al. 2012). In the Couris (2010) study, falls were likely the leading cause of SCI because of the sample selection was of an adult population (mean age = 51.3 years), which is consistent with other studies from North America reporting SCIs due to falls are most prevalent among older individuals.

In Europe, falls have recently been reported as either the leading cause of SCI (45.5% in regions of Norway, 41.0% in Estonia) (Hagen et al. 2012; Sabre et al. 2012) or the second leading cause (33.9% in Turkey, 24.6% in Spain, 30.9% in Iceland) (Cosar et al. 2010; Van Den Berg et al. 2011; Knutsdottir 2012). Similar to reports from North America, three European studies reported falls as the most common cause of SCI among elderly individuals.

In Asia, 5 studies reported falls to be the leading cause of SCI (Qureshi et al. 2010; Ning et al. 2011; Li et al. 2011; Wu et al. 2012; Wang et al 2013), and 5 studies reported falls as the second leading cause (Chabok et al. 2009; Wu et al. 2011; Chhabra and Arora 2012; Ibrahim et al. 2013, Hua et al. 2013). Whereas SCI due to falls is primarily reported among older individuals in North America and Europe, falls leading to SCI in Asia are a combination of low falls among older individuals and falls from heights among working age individuals in the construction industry (Li et al. 2011). Interestingly, in a recent review, Chiu et al. (2010) identified falls from heights to be the leading cause of SCI in developing countries.

Table 8: Falls

4.3 Sports and recreation

There were 100 different studies reporting data on sporting activities as a cause of SCI including both organized sports and recreational activities (table 9). 34 studies provided frequencies of SCI due to a specific sporting activity. The majority of studies were conducted in North America (Canada N=10; United States N=28) and Europe (N=24), and fewer reports were from Asia (N=16), Oceania (N=14), Africa (N=6) and South America (N=2). 16 studies reported on the frequency of SCI resulting from more than one specific sporting activity.

Studies reporting on sporting accidents as one cause of SCI among others include proportions ranging from a low of 0.2% in Tianjian, China (Ning et al. 2011) to a high of 23.8% in Russia (Silberstein and Rabinovich 1995). In the majority of these papers the proportion ranged between 7% and 16% (N=32 studies). Major sources of variation are likely due to differences in reporting techniques, inclusion criteria, and each study's definition of sports. Some studies fail to define the sporting activities considered for their estimates of SCI due to sports. For example, in the United States, several studies (Acton et al. 1993; Calancie et al. 2005; Cosar et al. 2010; McCammon and Ethans 2011) reported the frequency of SCI due to diving separately while other studies include diving in their overall estimates of SCI due to sporting accidents.

The frequency of SCI due to sports is relatively low in China. Recent reports indicate SCIs due to sporting accidents range from 0.2% (Ning et al. 2011) to 1.1% (Li et al. 2011, Hua et al. 2013). A reason for the relatively low frequency is that individuals in China are less active in sports that could lead to a SCI (e.g. skiing, diving, rugby) than individuals in countries where sports participation is higher (Ning et al. 2011; Li et al. 2011). Ning et al. (2011) speculate however that as China's society develops, changes in lifestyle will lead to more participation in high-risk sports that could lead to an increase in the number of sport-related SCIs.

Spinal cord injuries due to diving are commonly reported around the world, and their proportion is highest in Australia (9.4%) (Ring et al. 1986), Brazil (9.3%) (da Paz et al. 1992), and Finland (9.2%) (Dahlberg et al. 2005). Studies from the USA, Canada, and Japan also reported frequencies of SCI due to diving as high as 8.5% (Acton et al. 1993), 2.4% (McCammon and Ethans 2011) and 1.3% (Shingu et al. 1995), respectively. In a recent study focused on SCIs due to shallow-water diving in South Africa, Vlok et al. (2010), reported increasing numbers of SCIs from 2003 to 2009. The occurrences of injuries were most common during summer holidays, and among young males who consumed alcohol.

In South America, Africa, and Oceania, rugby was reported as a leading sports-related cause of SCI. In 16 studies examining SCI due to rugby, the incidence was as high as 4.6 per 10,000 player hours in South Africa (Jakoet and Noakes 1998), and the prevalence ranged from 1.7 (Rugby League) to 6.8 (Rugby Union) per 100,000 players in Australia between 1995 and 2003 (Berry et al. 2006). Hermanus et al. (2010) reported an increasing frequency of SCIs due to playing rugby in the South African Rugby Union between 1980 and 2007. The highest frequency of SCI was reported to be in 2006. Forwards sustained 76% of all SCIs, club players 60%, and those age 17 years had the highest number of SCIs (Hermanus et al. 2010). Other major causes of sports related SCI include skiing/snowboarding (N=7), ice hockey (N=4) and horseback riding (N=2). A report from the United States identifies skimboarding as a new cause of SCI, especially among young males (Collier et al. 2010). The authors' note that as the sport increases in popularity and more extreme maneuvers are performed, that associated risk of SCI with the sport will likely increase (Collier et al. 2010).

Table 9: Sports and Recreation

4.4 Violence

There were 63 papers reporting on SCI as a result of violence. 16 studies specifically cite gunshot wounds as a cause of SCI (table 10). 42 studies used data arising from hospital admission/discharge records which included either single or multiple hospitals. A total of 12 studies were based on national data from specifically designed SCI databases. Most of the studies were conducted in North America (Canada N=6; United States N=19) and Europe (N = 16). Asia had 12 studies, Africa had 6 studies, 2 studies were from Oceania, 1 from South America, and 1 from Russia.

In the USA, the proportion of SCI due to violence was found to range from a low of 0.97% (Fasset el al. 2007) to a high of 18.9% (Macciocchi et al. 2008). In Canada, reported proportions were mostly below 5%, with the exception of a recent study reporting a frequency of 8.2% based on data from the largest Canadian trauma centre (Pirouzmand 2010). In Europe, rates range from 1% in Germany (Exner and Meicnecke 1997) to 11.1% in Greenland (Pederson et al. 1989). Variation in the proportions is likely due to differences in both reporting and study population.

The proportions of SCI due to gunshot wounds among all causes of SCI are as high as 36% in South Africa (Hart et al. 1994) 26.9% in Brazil (da Paz et al. 1992), 21.3% in Turkey (Gur et al. 2005), and 25.8 % in Jordan (25.8%) (Otom et al.1997). High rates of SCI due to gunshot wounds tended to be found in countries with warfare or high rates of violent crimes. Other commonly reported causes of SCI due to violence were knife wounds (N=10 studies) and assault in general (N=6 studies).

Table 10: Violence

4.5 Self-Harm

There were 21 papers reporting on SCI as a result of self-harm (table 11). The majority of the studies used admission data (N=13 studies) from one or multiple hospitals; one study used an SCI-specific

registry, and another used a national health database (Wu et al. 2011). Eight studies were conducted in Europe; five studies were from each of North America and Asia, and one from Oceania.

Proportions of SCI caused by self-harm ranged from a low of 0.4% in Manitoba, Canada (McCammon and Ethans 2011) to a high of 25.9% in Greenland (Pedersen et al. 1989). Thirteen studies reported SCI due to self-harm in the range of 0.4% to 4.5%. In addition to Greenland, two other countries reported relatively higher proportions of self-harm as SCI cause: Finland with 10% (Dahlberg et al. 2005) and Israel with 13.6% (Catz et al. 2002). All three countries with high proportions of SCI due to self-harm also reported high frequencies of suicide.

Table 11: Self-Harm

4.6 Work-related Accidents

There were 17 papers reporting on SCI due to work-related accidents (table 12). Fifteen papers used admission data from one or multiple hospitals; one paper used data from a SCI registry. Studies on SCI due to work-related accidents came from Europe (N=4), Oceania (N=3), North America (N=4), Asia (N=4), South America (N=1) and Africa (N=1).

Proportions of SCI due to work-related injuries ranged from a low of 0.8% in Tinajin, China (Ning et al. 2011) to a high of 26.8% in Israel (Catz et al. 2002). Seven studies reported specific types of work leading to SCI with industrial work such as mining, forestry, farming as most frequent (Dixon et al. 1993; Tator et al. 1993; Stavrev et al. 1994; Igun et al. 1999; O'Connor 2001; Singh et al. 2003, McCammon and Ethans 2011). There was one paper reporting on SCIs specifically due to work-related accidents in Chile (Correa et al. 2011). The average annual incidence was 7.8 per million workers in Chile from 1986 to 2005. The 2005 prevalence rate was 112 cases per million workers. The most frequently affected ages ranged from 25 to 34 years. Cause of SCIs in the Chilean workplace included falls, being struck by objects, and MVCs (Correal et al. 2011).

Table 12: Work-related Incidents

4.7 Natural Disasters

Although natural disasters of significant magnitude are rare, their occurrences can have devastating effects. Natural disasters have the potential to not only lead to mass casualties but also to a sudden high frequency of severely injured persons. Because SCIs are only one type of severe injury that requires specialized and specific care, triage schemes are applied in order to allocate scarce resources to those who are most likely to benefit (Bensen et al. 1996; Jenkins et al. 2008). In such instances, patients with complex trauma might not be given immediate priority because of their smaller probability of survival (Gautschi et al. 2008) or surgical care may not be regarded as an immediate priority because resources are scarce (Sheng 1987). Thus individuals with SCI, in particular those with high lesions who may require surgical spinal stabilization and intensive acute care, may not receive the needed services, especially in regions with a lack of resources like transport facilities.

In low resource countries the health care infrastructure for SCI care and provision of pre-hospital, acute care, and rehabilitation are often inadequate. When faced with the consequences of a natural disaster, the health system becomes exposed with the understaffed and underequipped local medical emergency teams, and the lack of efficient transportation to provide services to remote rural regions. Even in regions with sufficient infrastructures, health services may be overwhelmed if many patients with major trauma need to be admitted at the same time. Regardless of region, most lay persons and first responders providing rescue and medical aid to survivors are not trained to provide adequate care for persons with SCI and do not know how to transport these individuals safely. Secondary lesions may result from well-intended but harmful manipulation.

We identified 12 studies with a focus on SCI resulting from natural disasters (table 13). These papers cover the earthquakes in Tangshan, China in 1976, Yerevan, Armenia in 1988, Hanshin, Japan in 1995, Bam, Iran in 2003, Kashmir, Pakistan in 2005, Sichuan, China in 2008, and Haiti in 2010. Of note, we did not find any publications reporting on SCI resulting from other types of natural disasters.

The frequency of SCI among all injuries ranged from 0.02% in Japan and Iran (Maruo and Matumoto 1996; Tahmasebi et al. 2005) to a high of 1.2% (n = 5000 SCIs) in China (Chang et al. 2000).

The majority of injuries reported were to the lumbar region of the spine, (Chen et al. 2009; Dong et al. 2009; Tauqir et al. 2006; Chang et al. 2000; Tanaka et al. 1997; Maruo and Matumoto 1996; Saramouzian et al. 2010) however, not all injuries resulted in damage to the spinal cord. The most common mechanism of SCI was being struck by a falling object while sitting or standing (Rathore et al. 2007; Maruo and Matumoto 1996).

Table 13: Natural Disasters

4.8 Other Causes

There were 48 papers reporting SCI due to “other causes” (table 14). In some studies, this may have included the specific causes discussed above, miscellaneous causes not mentioned earlier or unique causes of SCI. The majority of studies were from Europe (N=16 studies) with some representation from North America (N=13 studies), Asia (N=12 studies), Africa (N=3 studies) and Oceania (N=4 studies). Eighteen of these studies reported SCI due to being struck by an object.

Proportions of SCI due to “other causes” ranged from a low of 0.2% in Tianjin, China (Ning et al. 2011) to a high of 16.3% in Beijing, China (Li et al. 2011). The reported frequency of the majority of papers were between 5.3% and 11.0% (N = 16 studies). Proportions of SCI due to “struck by object” ranged from 2.0% in New Zealand (Dixon et al. 2003) to 18.6% in Beijing, China (Li et al. 2011). The majority of papers reported frequencies between 2% and 5% (N=9).

Table 14: Other

4.9 Summary – Frequency of SCI by Cause

Previous studies have indicated a lack of uniformity in data collection and reporting of information related to the various causes of SCI (Ackery et al. 2004). Because of this, it is difficult to compare results of individual studies. Nonetheless, as a result of our review, we have found that the most common causes of SCI reported around the world are motor vehicle crashes, falls, sports, violence, self-harm, and work-related accidents. Although most SCI results from these risks, a single natural disaster, such as an earthquake, may result in a sudden high burden of trauma in the affected populations. Depending on the type, intensity and extent of a disaster, such incidents can cause a large number of SCIs at one time, and therefore, deserve particular attention as a cause of SCI.

In order to truly understand what causes the large differences in SCI occurrence there is a need for a common approach to evaluate and report on the causes of SCIs in the various regions of the world (Ackery et al. 2004). Therefore, future epidemiological studies on SCI should employ commonly agreed methods of data collection and reporting in order to improve the comparability of data between regions. Such information will lead not only to greater usability of worldwide statistics on SCI, but also to better international injury prevention programs.

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Table 2: Incidence in the Americas

North America - Canada				
Author Year N	**Geographic Area**	**Inclusion and exclusion criteria**	**Definition of cases (nominator) and source population (denominator) used to calculate incidence**	**Incidence (per million inhabitants / year)**
Lenehan et al. 2012 N=930	British Columbia, Canada	1995-2004 Hospital admissions to level 1 trauma center were prospectively collected using a locally designed spine database	age-specific cases / Demographic structure for the population of Canada	42.2 (1995) 43.4 (1996) 39.4 (1997) 38.4 (1998) 27.9 (1999) 40.3 (2000) 33.8 (2001) 30.4 (2002) 28.7 (2003) 32.5 (2004)
Noonan et al. 2012 N=1785	Canada	Incidence rates from Dryden et al. 2003 were used to estimate incidence in Canada	Age-specific incidence rates from Dryden et al. / Demographic structure for population of Canada	53.0 (2010)
McCammon & Ethans 2011 N=553	Manitoba, Canada	1981-1985, 1998-2002, 2003-2007 Inclusion criteria: survival to hospital admission with TSCI, or outpatient referral to an SCI rehabilitation specialist. Exclusion criteria: congenital causes of paralysis such as spina bifida or cerebral palsy as well as acquired paralysis from multiple sclerosis or Guillan-Barre syndrome.	Winnipeg Rehabilitation Hospital at the Health Sciences Center and database at the Manitoba branch of the Canadian Paraplegic Association/Canadian Census Population results	17.1 (1981-1985) 19.5 (1998-2002) 25.6 (2003-2007)
Couris et al. 2010 N=936	Ontario, Canada	The study included all patients aged 18 years or older living in Ontario during the fiscal years 2003–2004 (through 2006–2007) who experienced TSCI.	Standardized incidence rates using the age structure of the Ontario population (census data) and age-specific incidence rates were estimated by sex and by year, and over the four cumulated fiscal years	24.2 (95% CI: 21.2-27.6) in 2003 23.1 (95% CI: 20.2-26.3) in 2006
Pickett et al. 2006 N=151	London, Ontario, Canada	1997-2006 Hospital admissions for SCI in Ontario Trauma Registry.	age specific cases / demographic structure general population from Statistics Canada data	40.8 (1997-2000) 21.0 (1997) 26.0 (1998) 44.0 (1999) 49.0 (2000)
Dryden et al. 2003 N=450	Alberta, Canada	1997-2000 Data from the Alberta Ministry of Health and Wellness, the Alberta Trauma Registry, and the Office of the Medical Examiner	All identified cases / Mid-year population census for 1998	52.5
Pickett et al. 2003 N=2385	Ontario, Canada	1994-1999 Hospital admissions for SCI in Ontario Trauma Registry.	age-specific cases /	37.2 (1994/95) 46.2 (1995/96)

North America - Canada				
Author Year N	**Geographic Area**	**Inclusion and exclusion criteria**	**Definition of cases (nominator) and source population (denominator) used to calculate incidence**	**Incidence (per million inhabitants / year)**
			demographic structure general population from Statistics Canada data	
Hu et al. 1996 SCI=122	Manitoba, Canada	1981-1984 Manitoba Health Services Insurance Plan database	records of hospital databases and physician reimbursement claims / 1982 Manitoba population census	40.0

North America - USA				
Author Year N	**Geographic Area**	**Inclusion and exclusion criteria**	**Definition of cases (nominator) and source population (denominator) used to calculate incidence**	**Incidence (per million inhabitants / year)**
Schoenfeld et al. 2011 N=5928	US Military	Incident cases of SCI between 2000-2009 in US military taken from Defense Medical Epidemiology database	Query of DMED to identify based on ICD-9-CM codes for SCI / Total population at-risk (military personnel)	429 (2000-2009)
Burke et al. 2001 N=161	Kentucky and Indiana counties, USA	1993-1998 University of Louisville Hospital SCI Trauma Registry and patient medical records	hospital SCI trauma registry / US Census Bureau's population estimates	25.2
Marshall 2000 N=106	County of San Diego, California, USA	1992-1997 San Diego County Trauma Injury	study of all trauma centers in San Diego County, including Children's Hospital / 1992 and 1997 census data	40.0 (1992) 40.0 (1997)
Surkin et al. 2000 N=395	Mississippi, USA	1992-1994 All SCI cases that occurred in the state of Mississippi	data from the SCI Surveillance System / Mississippi 1990 census data	77.0
Thurman et al. 1995 N=223	Utah, USA	1989-1991 Statewide injury reporting system from all state hospital and inpatient rehabilitation units and state death certificates.	age specific verified cases from 1989-1991 / 1990 U.S. census population	47.0 (age adjusted to 1980) 43.0 (crude)

North America - USA				
Author Year N	**Geographic Area**	**Inclusion and exclusion criteria**	**Definition of cases (nominator) and source population (denominator) used to calculate incidence**	**Incidence (per million inhabitants / year)**
Warren et al. 1995 N=139	Alaska, USA	1991-1993 SCI in Alaska Trauma Registry	total cases from 1991-1993 / population estimates published by Alaska Department of Labor	83.0
Price et al. 1994 N=376	Oklahoma, USA	1988-1990 Oklahoma residents with SCI in Oklahoma statewide multilevel surveillance system. Exclusion Criteria: People who died at scene of injury; Injuries to nerve roots or spinal plexus.	estimated cases using sensitivity of surveillance system by year and strata / Oklahoma population from 1990 census	51.0
Woodruff and Baron 1994 N=150	West Virginia, USA	1985-1988 West Virginia residents with SCI in Statewide reporting system Data collected during the West Virginia Spinal Cord Injury Registry, includes only injured patients surviving until hospitalization	data from the SCI Surveillance System / estimated resident population by Regional Research Institute of West Virginia University in 1985	25.0
Acton et al. 1993 N=644	Arkansas, USA	1980-1989 Arkansas State Spinal Cord Commission registry.	total cases by age group from 1980-1989 / age specific 1980-1989 Arkansas population,1980 and 1989 census data	28.5
Centers for Disease Control and Prevention 1991 N=5384	New York State, USA	1982-1988 All hospital discharges from acute-care facilities in New York State from the New York State Department of Health's Statewide Planning and Research Cooperative System	New York state hospital discharge data / Residents of New York State	43.0
Starr-Bocian 1991 N=522	Colorado, USA	1986-1991 SCI cases in Colorado and Wyoming Spinal Cord Injury Early Notification System (ENS)	annual cases for 1986-1991 / annual population of Colorado from 1986-1991 using U.S. Census data	26.5 (1986) 23.9 (1987) 24.7 (1988) 35.9 (1989) 38.8 (1990)
Griffin and Opitz 1985 N=154	Olmsted County, Minnesota, USA	1935-1981 Medical records-linkage system of the Rochester Project at the Mayo Clinic, periodic multi-centre surveys	Medical records / Population from census data	54.8 (1935-1981) 22.2 (1935-1944) 70.8 (1975-1981)

North America - USA				
Author Year N	**Geographic Area**	**Inclusion and exclusion criteria**	**Definition of cases (nominator) and source population (denominator) used to calculate incidence**	**Incidence (per million inhabitants / year)**
Bracken et al. 1981 N=66,204	USA	1970-1977 National Center for Health Statistics Hospital Discharge Survey	Survey results / Current Population Reports Series	40.1
DeVivo et al. 1980 N=not given	USA	National Model Spinal Cord Injury Data Base	Life-expectancy tables of SCI patients 9-86 years at time of injury	30.0
Kalsbeek et al. 1980 N=1,236 SCI=31	USA	1974 National Head and Spinal Cord Injury Survey	Hospital admissions / Midyear estimates of population size in 1974 based on data from the United States Bureau of the Census	50 (1974)

South America				
Author Year N	**Geographic Area**	**Inclusion and exclusion criteria**	**Methodology used to determine incidence**	**Incidence (per million inhabitants / year)**
Correa et al. 2011 N=173	Chile	Patients with traumatic SCI incurred in the workplace from 1986 to 2005 and were admitted to Hospital del Trabajador in Santiago, Chile.	Number of workers who suffer from TSCI divided by the total work force affiliated to ACHS in the same year. Total work force calculated as the average between the total work force at the beginning and at the end of each year.	7.8±3.6 (1986-2005)

Table 3: Incidence in Europe

Europe				
Author Year N	**Geo-graphic Area**	**Inclusion and exclusion criteria**	**Definition of cases (nominator) and source population (denominator) used to calculate incidence**	**Incidence (per million inhabitants / year)**
Knutsdottir 2012 N=207	Iceland	1975-2009 Patients admitted to Landspitali University Hospital	total cases/year / Population of Iceland	30 (1975-1979) 12.5 (1995-1999) 33.5 (2005-2009)
Perez et al. 2012 N=10,274	Spain	Hospitalizations for traumatic SCI between 2000 and 2009 in Spain	Incidence of cases between 2000 and 2009 / Population of Spain during the study period	23.5 (2000-2009)
Sabre et al. 2012 N=595	Estonia	Retrospective review of all medical records of patients with tSCI from January 19997 to December 2007	Incident cases of tSCI from hospitals / Estonian population during time period	39.4 (1997-2007)
Van Den Berg et al. 2011 N=540	Aragon, Spain	Hospitalized for traumatic SCI from January 1972 to December 2008, And received medical care in Aragon following the acute stabilization period, regardless of place of injury and acute care.	Not reported	8.2 (1972-1980) 13.8 (1981-1990) 12.9 (1991-2000) 13.4 (2001-2008)
Hagen et al. 2010 N=336	Norway (2 counties: Hordaland and Sogn og Fjordane)	Patients who suffered a TSCI from 1952-2001 and lived in Hordaland or Sogn og Fjordane	Number of new cases per 1 million inhabitants per year (grouped into 5 year intervals from 1952-2001)	6.2 (1952-1956) 26.3 (1997-2001) 3.3 (1952-1961) 10.7 (1992-2001)
Pietraszkiewicz & Tysiewicz-Dudek 2010 N=343	Lubuskie, Poland	Patients who were admitted to Lubuskie hospitals from 2005 to 2008, with codes corresponding to spinal cord injuries for International Classification of Diseases (ICD-10)	Not reported	14.5
Hagen et al. 2009 N=366	Western Norway	1952-2001 Discharges from 8 hospitals in region with SCI.	total incident cases in each year / population of two counties in region in each year	6.2 (1952-1956) 26.3 (1997-2001)
Ahoniemi et al. 2008 N=1647	Finland	1976-2005 Data from Käpylä Rehabilitation Centre database	Register survey; Medical records from registers of Käpylä Rehabilitation Centre	13.8 (1976-2005)
Kannus et al. 2007 1970 N=29 2004 N=228	Finland	1970-2004 All persons aged 50 or older admitted to Finnish hospitals for treatment of a fall induced severe cervical spine injury	number of cases / Finnish statistic for that population	52.0 (1970) 120.0 (2004)

Europe				
Author Year N	**Geo-graphic Area**	**Inclusion and exclusion criteria**	**Definition of cases (nominator) and source population (denominator) used to calculate incidence**	**Incidence (per million inhabitants / year)**
O'Connor and Murray 2006 N=46	Ireland	2000 Patients admitted to National Rehabilitation Hospital	total admissions in 2000 / population of Ireland in 1999	13.1
Albert et al. 2005 N=934	France	2000 Rehabilitation units; Patients admitted for first stay. Ages ≥15 years. Exclusion Criteria: Non-traumatic etiology; Neurological impairment due to peripheral nervous lesion; paraplegia due to brain injury; Follow up or readmissions to rehab unit.	Total estimated cases in 2000 / Population of metropolitan France over age of 15 years in 1999.	19.4
Gur et al. 2005 N=539	South-Eastern Anatolia, Turkey	1990-1999 4 hospitals that were major referral centers for trauma	New SCI cases / not given	12.1
Karacan et al. 2000 N=581	Turkey	1992 Nation-wide survey of SCI admissions to medical institutions. Exclusion Criteria: Patients who died before hospitalization.	(total cases from 49 cities who returned questionnaires) / (estimated population of the 49 cities in 1992 from State Institute of Statistics and General Directorate of Security of Ministry Interior)	12.7 (1992)
Van Asbeck et al. 2000 N=126	Netherlands	1994 Defined SCI cases within national registration system Exclusion Criteria: Spinal contusions with no or temporary neurological symptoms.	(Total identified cases/known group)*(total group) / Netherlands population	12.1
Caldana and Lucca 1998 N=577	Veneto, Italy	1994-1995 New cases of traumatic spinal cord injury and non-traumatic spinal cord disease treated in regional hospitals	traumatic injury and non-traumatic disease admitted to hospitals / Veneto population	14.3
Martins et al. 1998 N= 398	Central Region of Portugal	1989-1992 2 hospitals that treat all SCI in the central region of Portugal. Including deaths due to SCI and pediatric cases. Cases without neurological lesion, rehospitalization and vertebral lesions were excluded.	SCI cases from university hospital, city hospital and Institute of Legal Medicine / 1993 census data for the 6 districts that make up the central region of Portugal	57.8
Karameh-metoglu et al.	Southeast Turkey	1994	data from records of SCI /	16.9

Europe				
Author Year N	**Geo-graphic Area**	**Inclusion and exclusion criteria**	**Definition of cases (nominator) and source population (denominator) used to calculate incidence**	**Incidence (per million inhabitants / year)**
1997 N=75		Traumatic SCI in Southeast Turkey. SCI cases identified from emergency services, ICU, orthopedic and neurosurgery and rehabilitation medicine	1994 Turkey census data	
Karameh-metaglu et al. 1995 N=152	Istanbul, Turkey	1992 All new patients with SCI, including pediatrics.	SCI cases / 1992 Istanbul population	20.8
Soopramanie n 1994 N=412 (SCI=270)	Bucharest, Romania	1992-1993 SCI patients admitted to Dr Gh. Marinescu Hospital	Not given.	28.5
Stavrev et al. 1994 N=980	Plovdiv region, Bulgaria	1983-1992 Treatment for SCI at 2 clinics in Plovdiv region	1983-1992 total cases / Population of Plovdiv region	130.6
Knutsdottir 1993 N=79	Iceland	1973-1989 Patients admitted to rehabilitation unit in Reykjavik.	average new cases/year / population of Iceland	24.0 (1973-1982) 18.0 (1983-1989)
Garcia-Reneses et al. 1991 N=1010	Spain	1984-1985 Every traumatic and non traumatic SCI patient in specialized Spanish hospitals.	505 acute SCI/year / 38.5 million people in Spain	13.1
Biering-Sorensen et al. 1990 N=360	Kingdom of Denmark (Denmark, Greenland, Faroe Islands)	1975-1984 Admission to national specialized rehabilitation hospitals	traumatic SCI for whole of Denmark / average population for 10 year period	9.2
Koning and Frowein 1989 N=4431	Federal Republic of Germany	1983 Hospital admissions, Hamburg's Central Office for Paraplegic Patients, German Workmen's compensation, and General Local Health Insurance company	Hamburg Central Office for Paraplegic Patients, General Local Health Insurance users / Hospital admissions to 16 SCI Centers in FRG, German Workmen's Compensation new cases	36.0
Pederson et al. 1989 N=29	Greenland	1965-1986 Admissions to rehabilitation hospital in Hornback with traumatic SCI	total cases from 1965-1986 / average population of Greenland from 1968, 1977, 1986	26.0

Table 4: Incidence in Asia

Asia				
Author Year N	**Geographic Area**	**Inclusion and exclusion criteria**	**Methodology used to determine incidence**	**Incidence (per million inhabitants / year)**
Li et al. 2011 # of patients: N=1079 data collected: N=264	Beijing, China	Patients with acute TSCI admitted to civilian or military hospitals during Jan 1- Dec 31 2002	Number of ATSCI patients admitted in all hospitals in Beijing/ total population of Beijing	60.6 (2002) 6.7 (1982 to 1986)
Ning et al. 2011 N=869	Tianjin, China	All TSCI patients aged 15 or older admitted to tertiary hospitals in Tianjin from Jan 1, 2004- Dec 31, 2008	Average incidence rate calculated using population estimates from Tianjin Bureau of Statistics for 2006.	23.7
Yang et al. 2008 N=54,484	Taiwan	2000-2003 Spinal trauma cases in National Health Insurance database. Spinal injury with neurological deficit: (spinal injury incidence)* (% of total spinal injuries with neurological deficit) Exclusion Criteria: Subsequent admission for chronic care or other medical disorders	Spinal injuries: defined cases from 2000-2003 / Average # of insurance beneficiaries from 2000-2003 using National Health Insurance statistics	614.2 (spinal trauma) 174.0 (spinal injury with neurological deficits)
Chen et al. 1997 SCI=1,586	Taiwan	1992-1996 113 hospitals (11 medical centers, 50 regional general hospitals, 52 local general hospitals)	Hospital admissions / midyear population of Taiwan area	18.8 (1992-1996) 24.5 (1993) 19.6 (1994) 18.2 (1995) 17.2 (1996)
Otom et al. 1997 N=151	Jordan	1988-1993 Patients admitted to spinal unit of hospital in Amman. Exclusion Criteria: Patients who died before hospitalization; nontraumatic SCI.	total cases from 1998-1993 / hospital catchment population	18.0
Shingu et al. 1995 N=9752	Japan	1990-1992 Survey of nationwide institutions assumed to accept. SCI patients. Exclusion criteria: Patients only receiving outpatient services in this period.	sum of estimated cases in each prefecture / population of Japan from 1990-1992	40.2 (Frankel levels A-D)
Silberstein and Rabinovich 1995 N=196	Novosibirsk, Russia	1989-1993 All in patients with SCI admitted to the Department of SCI.	SCI patients over 5 years / 1994 Novosibirsk population	29.7
Shingu et al. 1994 N=3465	Japan	1990 Survey of nationwide institutions assumed to accept SCI patients. Exclusion criteria:	Sum of estimated cases in each prefecture / population of Japan in 1990	39.4 (Frankel levels A-D) 50.5

Asia				
Author Year N	**Geographic Area**	**Inclusion and exclusion criteria**	**Methodology used to determine incidence**	**Incidence (per million inhabitants / year)**
		Patients only receiving outpatient services in this year.		(Frankel levels A-E)
Ide et al. 1993 N=92	Okayama Prefecture, Japan	1988-1989 Handicapped registration system "Law for the Welfare of the Physically Disabled"	defined cases / 1985 National Census data	49.0 (all SCI) 28.6 (only traumatic)
Lan et al. 1993 N=99	Hualien county, Taiwan	1986-1990 Treatment of traumatic SCI in 4 hospitals in Hualien county. Exclusion Criteria: People who died before hospitalization; nontraumatic SCI; patients with transient paralysis; non residents of Hualien.	total cases from 1986-1990 / average population of Hualien from 1986-1990	56.1
Chen et al. 1985 N=560	Taipei, Taiwan	1978-1981 All record from general hospitals in Taipei. Included all spinal cord lesions.	Taipei inhabitants with SCI / Taipei residences	14.6

Table 5: Incidence in Oceania

Oceania				
Author Year N	**Geographic Area**	**Inclusion and exclusion criteria**	**Methodology used to determine incidence**	**Incidence (per million inhabitants / year)**
Derrett et al. 2012 N= 230	New Zealand	2007-2009 Admission to one of NZ's two spinal units.	All ages of tSCI and ntSCI admitted to NZ spinal units / Population of NZ from 2006 Census	30.0 (95% CI, 26-34)
O'Connor 2005 N=2959 (253 in 1997)	Australia	1986-1997 Australian Spinal Cord Injury Register; ages ≥ 15 years.	1997 cases / 1997 Australian Bureau of Statistics population data	17.3 (1997)
O'Conner 2002 N=265	Australia	1998-1999 Australian Spinal Cord Injury Register; ages ≥ 15 years. Transient neural deficits were excluded.	adult SCI cases / Denominator not given	14.5
Maharaj 1996 N=75	Fiji	1985-1994 Medical Rehabilitation Unit at Tamavua Hospital	Medical records of spinal cord paralysis patients admitted to the Medical Rehabilitation Unit at Tamavua Hospital / not given	5.6 (1986) 17.9 (1991) 10.0 (1986-1991)
Dixon et al. 1993 N=164 (1988)	New Zealand	1979-1988 SCI cases in Health Statistics Services files.	(total cases from 1988) + (Total cases from 1979-1988) / population of New Zealand Source and date not provided.	49.1 (1988) 43.3 (1979-1988)
Yeo 1993 N=772	New South Wales, Australia	1986-1992 Admission to 2 spinal units in Sydney with significant loss of motor power and sensation associated with SCI.	1986-1992 admissions / 1986-1992 population of NSW	19.2 (1986) 21.6 (1987) 20.3 (1988) 18.5 (1989) 18.8 (1990) 14.4 (1991) 15.6 (1992)

Table 6: Prevalence by Country

Prevalence by Country				
Author Year N	**Geographic Area**	**Inclusion and exclusion criteria**	**Methodology used to determine prevalence**	**Prevalence by million inhabitants**
Knutsdottir 2012 N=207	Iceland	1975-2009 Patients admitted to Landspitali University Hospital	Discharge incidence (survival rate)	526 (2009)
Noonan et al. 2012 N=not given	Canada	Incidence rates from Dryden et al. 2003	Annual discharge incidence of tSCI multiplied by life expectancy by severity of injury.	1,298 (2010)
Correa et al. 2011 N=173	Chile	Patients with traumatic SCI incurred in the workplace from 1986 to 2005 and were admitted to Hospital del Trabajador in Santiago, Santiago, Chile.	The number of workers who present with TSCI including new cases and cases of previous years that survive TSCI, subtracting those who died during the year divided by the total labor force affiliated to ACHS per year.	112 cases/million
Hagen et al. 2010 N=336	Norway (2 counties: Hordaland and Sogn og Fjordane)	Patients who suffered a TSCI from 1952-2001 and lived in Hordaland or Sogn og Fjordane	Not reported	36.5/100 000 inhabitants In Hordaland County 35.1/100,000 (95% CI: 29.8–41.1) In Sogn og Fjordane County 41.9/100,000 (95% CI: 30.6–56.1).
Dahlberg et al. 2005 N=152	Helsinki, Finland	1999 Adult citizens (18 years or more) of Helsinki who had permanent sensory or motor deficits because of traumatic SCI.	Number of SCI patients found (n=152) / Cross-sectional population of Helsinki (n=546,000)	280.0
O'Connor 2005 N=2959	Australia	1986-1997 Australian Spinal Cord Injury Register	Prevalence = (disease incidence)(disease duration)	681.0
Levi et al. 1995 N=353	Stockholm, Sweden	Stockholm SCI population	Survey of regional registers / 1991 Stockholm Regional Analysis Census	227.0
Razdan et al. 1994 N=616 SCI=15	Rural Kashmir, India	1986 Complete rural population of 63,645	House-to house screening and census, interview with neurologic team	236.0
Harvey et al. 1990 N=505	USA	1988 Traumatic SCI population in both institutional and non-institutional settings	Traumatic SCI survey / 1988 population census data US Bureau of the Census	721.0
Griffin and O'Fallon 1985	Olmsted County,	1935-1981	Population denominators from census data	197.0 (1950) 211.0 (1960) 356.0 (1970)

Prevalence by Country				
Author Year N	**Geographic Area**	**Inclusion and exclusion criteria**	**Methodology used to determine prevalence**	**Prevalence by million inhabitants**
N=154	Minnesota, USA	Medical records-linkage system of the Rochester Project at the Mayo Clinic	Total prevalence rates are age- and sex-adjusted to 1970 U.S. white population	473.0 (1980)
DeVivo et al. 1980 N=not given	USA	National Model Spinal Cord Injury Data Base	Life-expectancy tables of SCI patients 9-86 years at time of injury	906.0
Kalsbeek et al. 1980 N=1,236 SCI=31	USA	1974 National Head and Spinal Cord Injury Survey	Hospital admissions / Midyear estimates of population size for the contiguous United States in 1974 based on data from the United States Bureau of the Census	50.0

Table 7: Motor Vehicle Crash

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Hua et al. 2013 N=561	China	Retrospective review of individuals who were treated at The General Hospital of Chinese People's Armed Police Forces	Males = 79.9% Mean Age = 31.85 years	MVC Specific: Incomplete: 47.7% Cervical (55.7%) Cervical-Thor (4.5%) Thoracic (32.8%) Thor-Lumbar (4.5%) Lumbo-sacral (2.4%)	51.2%
Ibrahim et al. 2013 N=292 (traumatic and non)`	Kuala Lumpur, Malaysia	2006-2009 Admitted to the Department of Rehabilitation Medicine, Hospital Kuala Lumpur	Males = 77% Mean age = 39 years	Tetraplegia: 37% (108) Paraplegia: 63% (180)	Traumatic: MVC: 66%
Wang et al. 2013 N=761	Anhui Province, China	All patients admitted to two hospitals within Anhui Province, China between January 2007 and December 2010.	Males = 77.3% Mean age = 45 years	Cervical (46.3%) Thoracic (20.4%) Lumbrosacral (33.3%)	21.2%
Alshahri et al. 2012 N=307	Riyadh, Saudi Arabia	2003 to 2008 Traumatic SCI, admitted to Riyadh Military Hospital in Saudi Arabia	Males = 88% Mean age=29.5 years	Complete tetra = 21% Incomplete tetra = 31% Complete para = 29% Incomplete para = 18%	MVC: 85% (n=262)
Chhabra and Arora 2012 N=1138	India	All patients admitted to an Indian Spinal Injuries Centre 2002 to 2010.	85.5% males Mean age: 34.4 years	AIS A: 71.1% AIS B: 14.7% AIS C:8.2% AIS D: 6.0%	Road traffic accident: 45%
Knutsdottir 2012 N=207	Iceland	1975-2009 Patients admitted to Landspitali University Hospital	Males: 72% Mean Age: 38 years	Males: 72% Mean Age: 38 years	Road traffic Accidents: 42.5%
Lenehan et al. 2012 N=930	British Columbia, Canada	1995-2004 Hospital admissions to level 1 trauma center were prospectively collected using a locally designed spine database	Males = 80% Median: 35 years	Cervical: 45.1% Thoracic: 24.5% L/S: 20.9% Unspecified: 9.5%	Motor vehicle accident: 51.4%

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Middleton et al. 2012 N=324	New South Wales, Australia	January 2004 to June 2008, Data from Ambulance Service of New South Wales	Males = 85% Mean age = 42 years	Not Specified	MVC (on-road): 31.2% MVC (off-road): 9.3%
Sabre et al. 2012 N=595	Estonia	1997-2007 SCI patients admitted to any Estonia hospitals	Male:Female = 5.5:1 Average age of injury = 39.0 years	C1-C4, AIS, A, B, C = 9.9% C5-C8, AIS, A, B, C = 28.9% T1-S5, AIS , A, B, C = 26.7% All AIS D = 23.9% Unknown = 10.6%	MVC = 29.4%
Wu et al. 2012 N=143	Tianjin, China	Patients admitted to Tianjin Medical University General hospital with diagnosis of tSCI	Mean age 54.6 years Male:Female = 5:1	ASIA A = 5.6% ASIA B = 16.8% ASIA C = 18.9% ASIA D = 58.7%	MVC = 36.4%
Devivo et al 2011 N=45,442	USA	1935-2008 Persons who were treated at either a SCI Model System or a Shriners Hospital SCI unit	Males= 79.2% Mean age at injury= 32.5 years	19.8% C1-4 32.6% C 5-8 45.4% Paraplegic 2.2% Normal	MVC 45.4% (n=20,631)
Li et al. 2011 # of patients: N=1079 data collected: N=264	Beijing, China	Patients with acute TSCI admitted to civilian or military hospitals during Jan 1- Dec 31 2002	200 male (76%) Mean age: 41.7 years Range: 6-80 years	Cervical (n=13, 4.9%) Thoracic (n=74, 28%) Thoracolumbar, lumbar and lumbosacral (n=176, 66%)	MVC: 22.3% n=59

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
McCammon and Ethans 2011 N=553	Manitoba, Canada	1981-1985, 1998-2002, 2003-2007 Inclusion criteria: survival to hospital admission with TSCI, or outpatient referral to an SCI rehabilitation specialist. Exclusion criteria: congenital causes of paralysis such as spina bifida or cerebral palsy as well as acquired paralysis from multiple sclerosis or Guillan-Barre syndrome.	75.8% male Mean Age: 1981-1985: 29.0 years 1998-2002: 35.3 years 2003-2007: 39.8 years	1981-1985: Cervical: 46.2% Thoracic:33.0% Lumbar: 20.9% Sacral:0.0% 1998-2002: Cervical:45.0% Thoracic:33.3% Lumbar: 21.6% Sacral:0.0% 2003-2007: Cervical:51.3% Thoracic:34.9% Lumbar:12.5% Sacral:1.3%	Motor vehicle accident: 81-85: 44.5% 98-02:31.1 03-07: 28.8
Ning et al. 2011 N=869	Tianjin, China	All patients with TSCI aged 15 or older admitted to tertiary hospitals in Tianjin from Jan 1, 2004-Dec 31, 2008	738 male (84.9%) Mean age (sd) 46.0 (14.2)	Cervical (71.5%) Thoracic (13.3%) Lumbar (15.1%) Sacral (0.1%)	MVC: (34.1%) n=296
Stein et al. 2011 N=3524	USA	Case occupants older than 14 years old and in a vehicle accident between 1996 – Nov 2009 with cervical spine injuries.	1691 male (49.3%)	Automobile: 2,457, 71.5% Light truck: 305, 8.9% Utility vehicle: 460, 13.4% Van-based truck: 213, 6.2%	MVC: Frontal crash: 2,096, 61.4% Lateral: 1,094, 31% Rollover: 142. 4.0% Other: 80, 2.3%
Van Den Berg et al. 2011 N=540	Aragon, Spain	Hospitalized from January 1972 to December 2008 for traumatic SCI and received medical care in Aragon following the acute stabilization period, regardless of place of injury and acute care.	79% male, mean age 39.6±17.7 yrs.	36.9% (n=199) cervical 37.4% (n=202) thoracic 19.3% (n=104) lumbar 4.3% (n=23) sacral	Traffic accidents (57%)

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Wu et al. 2011 N=41,586	Taiwan	All SCI patients older than 20 years of age and admitted to medical services from 1998-2008 that were identified using the National Health Insurance Research Database of Taiwan.	62% male (n=25857) 61.2% had traumatic SCI (n=25,439)	Cervical: 51.8% N=21,557 Thoracic: 12.3% N=5,098 Lumbar: 22.9% N=9,533 Other SCI: 13.0% N=5,398	MVC: (58.8%) n=14,955 calculated using N traumatic SCI= 25,439)
Cosar et al. 2010 N TSCI=127	Turkey	Patients with traumatic SCI who participated in an in-patient rehabilitation program at a tertiary research hospital from 1996-2008.	67.7% (n=86) male mean age 37.81±13.65 years	36 (28.3%)-tetraplegic (C4-T1) 76 (59.8%)-paraplegic (T2–T12) 15 (11.8%) had conus–cauda equina (L1–S4) injury	MVC; (55.1%) n=70
Couris et al. 2010 N=936	Ontario, Canada	The study included all patients aged 18 years or older living in Ontario during the fiscal years 2003–2004 (through 2006–2007) who experienced TSCI.	74.1% (n=694) male mean age: 51.3±20.1 years	65.5% (n=610) cervical 21.3% (n=198) thoracic 10.0% (n=93) lumbar 3.2% (n=30) other	MVC: (24.5%) n=229
Hagen et al. 2010 N=336	Norway (2 counties: Hordaland and Sogn og Fjordane)	Patients who suffered a TSCI from 1952-2001 and lived in Hordaland or Sogn og Fjordane	Male to female ratio was 4:7:1 % of women varied from 6.9-24.4%	Complete (41.4%) Incomplete (58.6%) Cervical (52.4%) Thoracic (29.5%) Lumbar/sacral (18.2%)	MVC: 34.2% n=104 Car accident 19.9% Motorcycle accident 6.8% Bicycle accident 4.2% Pedestrian3.0%
Lieutaud et al. 2010 N=1523 (MST) N=144 (SCI)	France	1997-2006 Major spinal trauma (MST, AIS score 2 or more) and SCI (AIS score 4 or more)	Males= 63% Female= 37%	MST: 40% cervical 33% thoracic 36% lumbar SCI: 58% cervical 37% thoracic 6% lumbar	MST: *Car occupant* (n=804) *2-Wheel motorized riders* (n=329) *Pedestrians* (n=165) *Cyclists* (n=124) *Others* (n=101) SCI: *Car occupant* (n=73)

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
					2-Wheel motorized riders (n=47) *Pedestrians* (n=13) *Cyclists* (n= 7) *Others* (n=4)
NSCISC 2010 N=26,852	USA	1973-2009 26 federally funded Model SCI Care Systems and National SCI Database	Male= 80.8% (1973-2009) Mean age at injury = 40.2 years (2005-2009)	2005-2009 Tetraplegia = 55.2% Paraplegia = 44.4 % Complete Tetraplegia = 16.9% Incomplete tetraplegia = 38.3% Complete Paraplegia = 22.9% Incomplete Paraplegia = 21.5%	MVC: 41.3%
Pirouzmand 2010 N=12,192	Toronto, Canada	1986-2006 SCI and SI in Sunnybrook Trauma Registry Database	[SI Male=66% Median age=36 years] SCI Male= 76% Median age=33 years CSCI Median age= 30 years	[Spinal Injury= 23.2% -Cervical= 29% - Thoracic= 21% - Lumbosacral= 50%] SCI= 5.4% - Cervical=29% - Thoracic=21% - Lumbo-sacral = 50% - Multiple Levels= 20% CSCI=3%	MVC: 57%
Qureshi et al. 2010 N=521	Rawalpindi, Pakistan	All patients who suffered a spinal injury and were admitted to the Spine Unit of a tertiary care hospital in Pakistan from 2001-2008.	402 male (77%) Mean age (sd) 39.1 (16.17)	Level of injury: Thoraco-lumbar spine (n=369, 71%), lower cervical spine (n=93, 18%), upper cervical spine (n=42, 8%) and sacrum (n=9, 2%). Injuries at multiple levels in 8 (2%) Complete SCI-(43%) Incomplete SCI- (33%)	Road traffic accident: (32%) n=166

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Chabok et al. 2009 N=245	Guilan, Iran	Patients admitted to Poursina Hospital, with TSCI	71.8% male	Neurological status: 15 complete 29 incomplete 201 no neurological damage cervical- n=17 thoracic- n=6 thoracolumbar- n=48 Lumbar= 12	MVC: (52%) n=127
Obalum et al. 2009 N=468	Lagos, Nigeria	1992-2006 Registrars at the emergency room and wards from the Lagos University Teaching Hospital (receives the majority of SCI patients in Lagos)	Male=70.1% 66.2% were ages 40 years and below. Peak age incidence = 21-30 years.	ASIA A n=230 ASIA B n=45 ASIA C n=36 ASIA D n=41 ASIA E n= 34 Death n=82 Lumbar n=278 Cervical n=142 Thoracic n=48	MVC: 77.4% (n=362)
Ahoniemi et al. 2008 N=1647	Finland	1976-2005 Register survey; Medical records from registers of Käpylä Rehabilitation Centre	Male= 83% Mean age of injury (M/F): 1976-1985: 34.7/35.8 1986-1995: 36.7/38.3 1996-2005: 42.4/40.4	50.6% tetraplegia 49.4% paraplegia	MVC: 39.5% (n=650)
Macciocchi et al. 2008 N= 298	South-eastern, USA	2004-2005 All patients admitted for traumatic SCI between the ages 16-59. Excluded if unable to speak English.	Male=79% Mean age =28.7±10.1 years. 74% of all eligible patients.	C1-4 ASIA A-C, n=9 C1-4 ASIA D, n=5 C5-8 ASIA A-C, n=30 C5-8 ASIA D, n=6 T1-8 ASIA A-C, n=26 T1-8 ASIA D, n=2 T9-12 ASIA A-C, n=15 T9-12ASIA D, n=3 L1-S3 ASIA A-C, n=5	MVC: 63% (n=188)
National Spinal Cord Injury Statistical Center 2008 N=25,415	USA	1973-2008 Residents of the US who have sustained traumatic SCI. Data from Model SCI Care Systems captures approx 13% of all new SCI cases in the U.S.	Male=77.8% (2000-2008) Average age = 39.5 years (2005-2008)	2000-2008 Incomplete tetraplegia: 34.1% Complete paraplegia: 23.0% Complete tetraplegia:18.3% Incomplete paraplegia: 18.5%	MVC: 42% (n=10,674)

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Fassett et al. 2007 N=412	Philadelphia, Pennsyl-vania, USA	1978-2005 Geriatric patients treated in Delaware Valley Regional Spinal Cord Injury Center at Thomas Jefferson University Hospital	≥70 years old. No further demographics given	High quadriplegic (C4 and above)=42% Paraplegic=22% ASIA A ~ 45% ASIA B ~ 13% ASIA C ~ 15% ASIA D ~ 24%	MVC: 13% (n=54) Pedes-trian: 2% (n=8)
Shrestha et al. 2007 N=149	Eastern region, Nepal	2001-2004 Admission to hospital in Dharan with cervical spinal injury.	Males=80% Mean age=40 (6-88) years Mortality=6 (4%)	Frankel levels: A=54 (36%) B=20 (13%) C=22 (15%) D=19 (13%) E=34 (23%)	MVC: 21.5% (n=32)
Olasode et al. 2006 N=71	Ile-Ife, Nigeria, Africa	All traumatic SCI within an 18 month period were included. Only patients with significant craniocerebral injuries were excluded.	Males=66.7% Age range=12-80 years	tetraplegic n=39 paraplegic n=13 recovered with no residual disability n=14 died n=5	MVC: 89% (n=63)
Pickett et al. 2006 N=151	London, Ontario, Canada	1997-2006 Admissions to hospital in London, Ontario with SCI	Men=74.2% Mean age = 42.2 ± 20.9 (9-96) years Mortality=12 (8%)	Cervical=75% Thoracic= 10% Lumbar=9% Junctional=6% Complete=35% Incomplete=65%	MVC: 35.1% (n=53) Other type of vehicle 11.9% (n=18)
Calancie et al. 2005 N=229	Dade County, Florida, USA	Acute traumatic spine and/or spinal cord injury admitted to Jackson Memorial Hospital	Male = 74.6% Average age at injury=40.0±17.5 years 15 were children	ASIA A = 32.8% (75) ASIA B = 4.8% (11) ASIA C = 24.0% (55) ASIA D = 31.5% (72) ASIA E = 7.0% (7.4) Fractures: Cervical = 62% T1-T10 = 15% (35) T11-L4 = 19% (44) Non-fractures: Cervical = 3% (7) Complete = 32.8%	MVC: 43.2% (n=99), Pedestrians hit by car=3.9% (n=9), Motorcycle=1.7% (n=4)

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Dahlberg et al. 2005 N=152	Helsinki, Finland	January 1, 1999 cross-section date Adult citizens (18 years or more) of Helsinki who had permanent sensory or motor deficits because of traumatic SCI (ASIA A–D). ASIA-E cases were excluded.	Males = 76% Average age of injury=47.9 years	Data only for 121 subjects: 46% (n=56) tetraplegia 54% (n=65) paraplegia 57% (n=69) incomplete 43% (n=52) complete	MVC: 35% (n=53)
Gur et al. 2005 N=539	South-eastern Anatolia, Turkey	1990-1999 4 hospitals that were major referral centers for trauma	Male= 77.2% Average age of injury=30.62 (1-70) years	Incomplete paraplegia 29.3% (n=158) Complete paraplegia 45.1% (n=243) Incomplete tetraplegia 13.7% (n=74) Complete tetraplegia 13.9% (n=75) Cervical: 25.4% (n=137) Thoracic: 36.7% (n=198) Lumbar: 34.0% (n=183)	MVC: 37.1% (n=200)
Lakhey et al. 2005 N=233	Dharan, Nepal	May 1997- April 2001 Orthopaedic ward of BP Koirala Institute of Health Sciences	Male=72.5% <20years old=26 individuals (11.1%), 20-30yrs=59 (25.3%), 31-40yrs=49 (21.0%), 41-50yrs=37 (15.9%), >50yrs=62 (26.6%)	cervical = 88 (37.8%) dorsal = 70 (30.0%) lumbar = 72 (30.9%) none bony = 3 (1.3%) complete = 46.8%	MVC: 6.9% (n = 16)
Umaru and Ahidjo 2005 N=36	Maiduguri, Nigeria	1998-2002 Admissions to hospital in Maiduguri with SCI. Exclusion Criteria: Cases with inadequate information	Males=83% Mean age=34.3±3 (13-55) years Mortality=3 (8%)	Cervical=14 (39%) Thoracic=10 (28%) Thoracolumbar=10 (28%) Lumbar=2 (6%) Complete=20 (56%) Incomplete=16 (44%)	MVC: 61.1% (n=22)

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Dryden et al. 2003 N=450	Alberta, Canada	1997-2000 Data from the Alberta Ministry of Health and Wellness, records from the Alberta Trauma Registry, and death certificates from the Office of the Medical Examiner	71.6% male Median age of injury=35.0 years	61.5% (n=277) cervical 17.3% (n=78) thoracic 17.1% (n=77) lumbar/sacral/ cauda equina 4.0% (n=18) unspecified	MVC: 56.4% (n=254)
Krassioukov et al. 2003 N=58	Toronto, Canada	1998-2000 Admissions to hospital in Toronto with traumatic SCI. Exclusion Criteria: Patients admitted with ASIA E.	Males=87% Ages 17-59 years: Mean age=38.7 (17-56) years	ASIA A and B=30% ASIA C and D=70%	MVC: 31% (n=18)
Kuptnirat-saikul 2003 N=83	Thailand	1997-2000 All SCI patients admitted to Spinal Unit, Siriraj Hospital, Nagkok.	Males=79.5% Average age =32.3 ±11.7 years.	Tetraplegic n=19 Paraplegic n=18 ASIA D=25	MVC: 75.7% (n=63)
Pagliacci et al. 2003 N=684	Italy	1997-1999 Rehabilitation admissions to 32 institutions in Italy with traumatic SCI.	Males = 80% Mean age=38.5 (11-94) years.	ASIA Scores: A=346 (50%) B=72 (10%) C=149 (22%) D=94 (14%) E=12 (2%)	MVC: 53.8% (n=684)
Pickett et al. 2003 N=2385	Ontario, Canada	1994-1999 SCI in Ontario Trauma Registry	Males=69% <20 years =17% 20-39 years= 44% 40-59 years=23% ≥60 years=16	Not given.	MVC: 42.8% (n=1021) Automobile =75% Motorcycle =7% Bicycle=3% Pedestrian =6% Other=10%
Singh et al. 2003 N=483	Haryana, India	2000-2001 Accident and emergency services and department of Orthopaedic Surgery and Rehabilitation of Pt. B.D. Sharma PGIMS, Rohtak.	Male=74.7% male Mean age at injury=35.4 years	164 tetraplegia 283 paraplegia	MVC: 34.8% (n=168)

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Catz et al. 2002 N=250	Israel	1959-1992 Traumatic SCI, admitted to the Loewenstein Rehabilitation Center, the major referral center for rehabilitation medicine in Israel.	Males=75.6% Mean age = 34.5 years (range 6-83 years).	High cervical 7.6% low cervical 28.8% thoracic 32.4% lumbar 31.2%	MVC: 32.8% (n=82)
O'Connor 2002 N=265	Australia	1998-1999 Australian Spinal Cord Injury Register (ASCIR) for persons 15 years and older. All adult SCI cases are reported to the ASCIR Transient neural deficits were excluded.	Male= 76 % No other demographics given	C4 n=47 C5 n=45 C6 n=22 L1 n=30 T12 n=17 Incomplete tetraplegia n=101 Incomplete paraplegia n=64 Complete tetraplegia n=51 Complete paraplegia n=48	MVC: 43% (n=114)
Burke et al. 2001 N=161	Kentucky and Indiana counties, USA	1993-1998 University of Louisville Hospital SCI Trauma Registry and patient medical records	Male=75% male Mean age of injury=34.0 years 59.5% single 29.4% married 85.5% White 14.5% African American	56.5% cervical 28% complete (all cases) 58% Frankel A 17% Frankel B 7% Frankel C 15% Frankel D	MVC: 54.7% (n=88)
Karacan et al. 2000 N=581	Turkey	1992 Nation-wide survey of SCI admissions to medical institutions. Exclusion Criteria: Patients who died before hospitalization.	Males=71% Mean age=35.5±15.1 years. Females=166 (29%)	Cervical=31.7% Thoracic=26.6% Lumbar=25.1% Tetraplegia=87 (32%) Paraplegia=394 (68%)	MVC: 48.8% (n=283)
National Spinal Cord Injury Statistical Center (NSCISC) 2000 N=19648	USA	1973 -1990's 24 federally funded Model SCI Care Systems and National SCI Database	Male= 81.7% Mean age at injury=31.8 years; 55% within 16-30 years old	Tetraplegia = 51.7% Paraplegia = 46.7 % Complete Tetraplegia = 18.5% Incomplete tetraplegia = 29.5% Complete Paraplegia = 27.9% Incomplete Paraplegia = 21.3%	MVC: 37.4% (n= 7348)

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Ravaud et al. 2000 N=1668	France	1995-1996 Self-administered questionnaire survey at 35 specialized Rehabilitation Centres	Males (73%) Mean age of injury=30.5 years	7.4% C1-C2 16.4% C3 26.3% C4 28.5% C5 18.6% C6 2.5% C7-C8 54% complete	MVC: 57.9% (n=959)
van Asbeck et al. 2000 N=126 (specific data for 113)	Netherlands	1994 Patients with SCI in National Registration system. Further analysis occurred only for cases in which medical records were obtained Exclusion Criteria: Spinal contusions with no or temporary neurological symptoms.	Males=77% <20 years=15 (13%) 21-30 years=28 (25%) 31-60 years=36 (32%) >61=34 (30%) Mortality=18 (16%)	Complete tetraplegia=26 (23%) Incomplete tetraplegia=39 (34%) Complete paraplegia=29 (26%) Incomplete paraplegia=19 (17%)	MVC: 31.0% (n=35)
Igun et al. 1999 N=68	Plateau State, Nigeria	1984-1997 Radiologically confirmed diagnosis of spinal cord injury.	Males=91.2% Mean age = 30 years.	Cervico-thoracic n=32 Cervico-thoracic n=36 Deaths n=18	MVC: 51.5% (n=35)
Caldana and Lucca 1998 N=127	Veneto, Italy	1994-1995 New cases of traumatic spinal cord injury and non-traumatic spinal cord disease treated in regional hospitals (small hospitals excluded)	Male = 83.5%; average age of 39.8 years Female = 16.5%; average age of36 years	Cervical=62 (21 were complete) Thoracic=29(25) Thoracolumbar (T12-L1)=18(11) Caudal=14(3) Unidentified=1	MVC: 53% (n=306) Other road accidents=19% (n=110) (Motorbike=7, Moped=7, Bicycle=3, Pedestrian=2)

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Farmer et al. 1998 N=1817	USA	1979-1993 Regional Spinal Cord Injury Center of Delaware Valley (RSCICDV)	Male=78.7% Mean age=37.6 years 72.2% White, 23.5% African American, 2.5% Hispanic 35.9% married 16% unemployed	62.4% cervical 26.8% thoracic 10.8% lumbosacral 40.9% complete 59.1% incomplete 25.1 % quadriplegia complete 36.7% quadriplegia incomplete 15.8% paraplegia complete 21.5% paraplegia incomplete	MVC: 29.9% (n=543)
Levy et al. 1998 N=136	Zimbabwe	1988-1994 Admissions to National Rehabilitation Centre with traumatic SCI.	Males=89% Majority were between 20 and 49 years of age	Cervical=69 (51%) Below Cervical=67 (49%)	MVC: 50% (n=68)
Martins et al. 1998 N= 398	Portugal	1989-1992 2 hospitals that treat all SCI in the central region of Portugal. Including deaths due to SCI and paediatric cases. Cases without neurological lesion, rehospitalization and vertebral lesions were excluded.	Male=77% Average age = 50.53±21.85 years	Complete n=220 Incomplete n=176 Deaths = 223	MVC: 57.3% (n=228)
Aung and Masry 1997 N=219	Great Britain	1985-1988 New traumatic admissions to the Midlands Centre for SCI	Male=79%; Average age of 35.5 years. Female=21%; Average age of 44.2 years.	Cervical n=116 Thoracic n=73 Lumbar n=30	MVC: 50% (n=110)
Exner and Meinecke 1997 N= 22,212	Germany	1976-1996 All traumatic and non-traumatic SCI	72% male.	62% paraplegic 38% tetraplegic	MVC: 35% (n=7774)

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Maharaj 1996 N=75	Fiji	1985-1994 Medical records of spinal cord paralysis patients admitted to the Medical Rehabilitation Unit at Tamavua Hospital	Male=87% Mean age=38.3 (6-76) years Fijian=60% Indian=35% Employed =47% Unemployed =41%	40 (53%) tetraplegia 35 (47%) paraplegia 46 (61%) complete 29 (39%) incomplete	MVC: 25.3% (n=19)
Karameh-metaglu et al. 1995 N=152	Istanbul, Turkey	1992 New patients with traumatic SCI, including pediatrics.	Males=75.6% Mean age = 33 years. 72% of patients were under 40.	Tetraplegic n=50 Paraplegic n=102	MVC: 41% (n=62)
Levi et al. 1995 N=353	Stockholm, Sweden	1991-1994 Survey of the regional Stockholm SCI population	Males=81% Average age of injury=31 (3-77) years	Cervical 41.6% (n=147) Thoracic 36.0% (n=127) Lumbar 14.7% (n=52) Sacral 1.4% (n=5) Complete 39.4% (n=139) Incomplete 59.5% (n=210)	MVC: 45.6% (n=161)
Shingu et al. 1995 N=9752	Japan	1990-1992 Survey of nationwide institutions assumed to accept SCI patients. Exclusion criteria: Patients only receiving outpatient services in this period	Males=80.4% Mean age=48.6±19.1 (0.92-96) years.	Frankel levels: A=2518 (25.8%) B=1208 (12.4%) C=1984 (20.3%) D=1761 (18.1%) E=2242 (23.0%) Unknown=39 (0.4%) Cervical=7317 (75.0%) Below cervical=2408 (24.7%) Unknown=27 (0.3%) Complete=61.1%	MVC: 43.7% (n=4261)
Silberstein and Rabinovich 1995 N=196	Novosibirsk, Russia	1989-1993 All in patients with SCI admitted to the Department of SCI. Nerve root or plexus injury was excluded.	Males=93.4% Mean age =34.7 years.	Cervical spine C1-2 n=15 C3-7 n=81 Thoracic T1-12 n=54 Lumbar L1-5 n=46	MVC: 25.1% (n=49)

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Thurman et al. 1995 N=223	Utah, USA	1989-1991 Utah residents with SCI in Statewide reporting system of the Utah Department of Health, Bureau of Epidemiology.	Male= 76% Median age=29 years	128 (57%) tetraplegia 95 (43%) paraplegia 41 (18%) fatal 21 (9%) died before hospital admission 110 (49%) Frankel A/B/C 46 (21%) Frankel D 25 (11%) returned to full neurological function	MVC= 49.3% (n=110)
Hart et al. 1994 N=616	South Africa	1988-1993 All records of SCI from the Natalspruit Spinal Rehabilitation Unit	Males=80% Males between 15-40 made up the majority of patients	Complete n=404 Incomplete n=212 Cervical spine n=155 Upper thoracic n=135 Lower thoracic n=249 Lumbar spine n=74	MVC: 25% (n=154)
Price et al. 1994 N=376	Oklahoma, USA	1988-1990 SCI cases in Oklahoma statewide multilevel surveillance system Exclusion Criteria: Non Oklahoma residents; patients who died at scene; injuries to nerve roots or spinal plexus.	Male= 80% <15 years=12 (3%) 15-19 years=66 (18%) 20-29 years=110 (29%) 30-59 years=145 (39%) ≥60 years =43 (11%) Mortality=30 (8%)	Complete tetraplegia=55 (15%), Incomplete tetraplegia=157 (42%) Complete paraplegia=59 (16%), Incomplete paraplegia=105 (28%)	MVC: 47.9% (n=180)
Shingu et al. 1994 N=3465	Japan	1990 Survey of nationwide institutions assumed to accept SCI patients; Exclusion criteria: Traumatic cervical syndrome cases and extradural nerve root; Patients only receiving outpatient services in this year or who obtained injury abroad	Male=81.2% Mean age=44.1 years	Cervical=1218 (79%) Below cervical=328 (21%) Unknown=1	MVC: 44.6% (n=1545)

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Soopramanie 1994 N=412 (SCI=270)	Bucharest, Romania	1992-1993 SCI patients admitted to Dr Gh. Marinescu Hospital	Males=77% 37.6% labourer 8.7% farmer 18.2% retired	158 cervical 81 thoracic 36 lumbar 47% incomplete Frankel grade A n=134 Frankel grade B n=24 Frankel grade C n=25 Frankel grade D n=73 Frankel grade E n=150	MVC: 13% (n=54)
Stavrev et al. 1994 N=980	Plovdiv and Plovdiv region, Bulgaria	1983-1992 Treatment for SCI at 2 clinics in Plovdiv region	Males=72% ≤20 years=82 (8%) 21-40 years=387 (40%) 41-60 years=298 (30%) 61-70 years=137 (14%) >70 years=76 (8%) Mortality=72 (7%)	Cervical=206 (21%) Thoracic (>T7) =275 (28%) Lumbar=399, (41%) Other=100 (10%) Neurological deficit=409 (42%) No neurological deficit=572 (58%)	MVC: 37.4% (n=367)
Woodruff and Baron 1994 N=150	West Virginia, USA	1985-1988 Data collected during the West Virginia Spinal Cord Injury Registry, includes only injured patients surviving until hospitalization	Male= 82% Majority of individuals were between 15-24.	57% tetraplegia 43% paraplegia	MVC: 57% (n=86)
Acton et al. 1993 N=644	Arkansas, USA	1980-1989 Arkansas residents in Arkansas State Spinal Cord Commission registry. Exclusion Criteria: Lesions caused by degenerative disease; people who died at scene.	Males=80% Mean age males=32.4 years Mean age females=35.4 years	Tetraplegia=124 Paraplegia=181	MVC: 80% (n=515) Motorcycle= 11% (n=71) Off road vehicles= 4% (n=26) Bicycles= 3% (n=19) Pedestrian = 2% (n=13)

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Dixon et al. 1993 N=164	New Zealand	1988 SCI cases in Health Services Statistics files.	Males=73.2% Males aged 15-29 years=46%	C1-C4=49 (30%) C5-C7=30 (18%) T1-T6=19 (12%) T7-T12-19 (12%)	MVC: 54% (n=89)
Lan et al. 1993 N=99	Hualien county, Taiwan	1986-1990 Treatment of traumatic SCI in 4 hospitals in Hualien county. Exclusion Criteria: People who died before hospitalization; nontraumatic SCI; patients with transient paralysis; non residents of Hualien.	Males=80% Mean age (males)=44 years Mean age (females)=46 years Mortality=10 (10%)	Complete tetraplegia =5 Incomplete tetraplegia = 5 Complete paraplegia =6 Incomplete paraplegia = 7	MVC: 61.6% (n= 61)
Tator et al. 1993 N=201	Toronto, Canada	1974-1981 First 220 admissions to Acute Spinal Cord Injury Unit in Toronto. Exclusion Criteria: Admissions >30 days after injury; spinal injuries without cord involvement; nerve root involvement only; penetrating injuries; injuries below L2; Patients who died on scene or upon arrival.	Males=79.6% Mean age=34.5 years Median age=27.0 years	Cervical=63.2%, Thoracic=16.9%, Thoracolumbar=19.9% Complete=46.2%, Incomplete=53.8%	MVC: 40.8% (n=82)
da Paz et al. 1992 N=1255 (SCI=108)	Brazil	1988 36 public hospitals from 7 Brazilian capitals (represents 6.2% of all hospitals and 9.2% of the total hospital bed capacity.	Male=80.6% Mean age= 30.3 (range 6-56) years 5.6% high education	94 (87.0%) complete 61 (64.9%) paraplegia 33 (35.1%) quadriplegia	MVC: 41.7% (n=45)
DeVivo et al. 1992 N=6563	USA	Admissions to Spinal Cord Injury Care Systems within 1 year of injury from: 1973-1977	N=1955 Males=81.9% Mean age=28.0 years	Frankel grade at discharge: Complete=56.4% Sensory=9.7% Motor nonfunctional=9.0% Motor functional=24.1% Recovered=0.8%	MVC: 42.5%

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
		1978-1980	N=1784 Males=82.4% Mean age=28.4 years	Frankel grade at discharge: Complete=51.8% Sensory=13.7% Motor nonfunctional=7.2% Motor functional=25.9% Recovered=1.4%	MVC: 48.0%
		1981-1983	N=1391 Males=82.7% Mean age=30.5 years	Frankel grade at discharge: Complete=57.2% Sensory=11.7% Motor nonfunctional=7.8% Motor functional=22.5% Recovered=0.8%	MVC: 48.8%
		1984-1986	N=1433 Males=84.5% Mean age=31.2 years	Frankel grade at discharge: Complete=48.6% Sensory=16.2% Motor nonfunctional=11.0% Motor functional=23.5% Recovered=0.6%	MVC: 44.9%
Dincer et al. 1992 N=1,694	Turkey	1974-1985 SCI patients admitted to Ankara Rehabilitation Centre	Males = 75.7% Average age of injury=26.8 (1-70) years Agricultural workers= 19.8% (n=336) Housewives= 19.9% (n=338) Private industry workers = 19.5% (n=330)	Complete paraplegia 85.1% (n=1442) Incomplete paraplegia 6.9% (n=116) Complete tetraplegia 4.8% (n=82) Incomplete tetraplegia 3.2% (n=54)	MVC: 35.4% (n=600)
Garcia-Reneses et al. 1991 N=1010	Spain	1984-1985 Every traumatic and non traumatic SCI patient in specialized Spanish hospitals	Male=72.4%. Mean age = 41.8 ± 1.2 years.	Sensory-motor incomplete SCI = 49% Complete SCI= 38%	MVC: 52.2% (n=527)
Goebert et al. 1991 N=59	Hawaii, USA	1987-1989 Traumatic injury Patient at the Rehabilitation Hospital of the Pacific	Male=84.7% Mean age=20.2 years 0-15years=5.2% 16-30 years=44.8% 31-45 years=25.9% 46-60 years= 12.1% 61-90 years=12.1%	High Quad (C1-4)=16.2% Low Quad (C5-8)=45.9% High Thoracic (T1-6)=18.9% Low Thoracic (T7-12)=10.8% Lumbar (L1-5)=8.1% Frankel Grades: Complete (A)=50.8% Motor functional (D)=35.6%	MVC: 37.9% (n=22) automobile =81.1% of motorcycle =13.6%, bicycle =4.5%

MVC					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: % (n of cases)**
Biering-Sorensen et al. 1990 N=268	Kingdom of Denmark (Denmark, Greenland, Faroe Islands)	January 1975-December 1984 Admission to national specialized rehabilitation hospitals	Male=76.9% 40% within 15-24 years old	268 traumatic lesions Cervical = 136 Thoracic = 76 Lumbar = 56 Complete tetraplegia = 22% Incomplete tetraplegia = 29% Complete paraplegia = 26% Incomplete paraplegia = 23%	MVC: 47% (n=125)
Ring et al. 1986 N=202	New South Wales, Australia	1977-1978 Admissions to New South Wales hospitals with spinal injury; death certificates that involved spinal injury. 99% of cases had neurological involvement.	Males= 81% ≤1 years=2 (1%) 2-14 years=13 (6%) 15-24 years=84 (42%) 25-44 years=58 (29%) 45-64 years=30 (15%) ≥65 years=15 (7%) Mortality=69 (39%)	Glasgow Outcome Scale: Severe disability=98(49%) Moderate disability=19 (9%) Good recovery=13 (6%) Not recorded=3 (1%)	MVC: 65.3% (n=132)
Chen et al. 1985 N=560	Taipei, Taiwan	1978-1981 All record from general hospitals in Taipei. Included all spinal cord lesions with or without vertebral injury.	Males=86% Mean age = 35.9 (range 20-49) years.	Incomplete Paraplegia n=118 Complete paraplegia n=180 Incomplete Tetraplegia n=117 Complete Tetraplegia n=145 Death n=31	MVC: 44.5% (n=249)
Griffin and Opitz 1985 N=154	Olmsted County, Minnesota, USA	1935-1981 Medical records-linkage system of the Rochester Project at the Mayo Clinic, periodic multi-centre surveys	Male= 72% 153 White, 1 Black	56.5% (n=87) cervical 31.8% (n=49) thoracic 9.1% (n=14) lumbar 2.6% (n=4) sacral	MVC: 69.8% (n=106)
Gee and Sinha 1982 N=36	Papua New Guinea	1978-1981 Traumatic injury Patients that stayed in Port Moresby, Lae and Manding hospitals	Male = 88% Mean age = 26years (range 16-41 years)	Cervical = 22% Upper thoracic = 11% Thoraco-lumbar = 28% Lumbar = 39%	MVC: 34 % (n=12)

Table 8: Falls

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Hua et al. 2013 N=561	China	Retrospective review of individuals who were treated at The General Hospital of Chinese People's Armed Police Forces	Males = 79.9% Mean Age = 31.85 years	Fall Specific: Incomplete: 47.7% Cervical (45.5%) Cervical-Thor (2.2%) Thoracic (33.6%) Thor-Lumbar (8.2%) Lumbo-sacral (10.4%)	23.9%
Ibrahim et al. 2013 N=292 (traumatic and non)`	Kuala Lumpur, Malaysia	2006-2009 Admitted to the Department of Rehabilitation Medicine, Hospital Kuala Lumpur	Males = 77% Mean age = 39 years	Tetraplegia: 37% (108) Paraplegia: 63% (180)	Traumatic: Falls 28 %
Wang et al. 2013 N=761	Anhui Province, China	All patients admitted to two hospitals within Anhui Province, China between January 2007 and December 2010.	Males = 77.3% Mean age = 45 years	Cervical (46.3%) Thoracic (20.4%) Lumbrosacral (33.3%)	Fall: 52.6% Low Fall: 12.7%
Alshahri et al. 2012 N=307	Riyadh, Saudi Arabia	2003 to 2008 Traumatic SCI, admitted to Riyadh Military Hospital in Saudi Arabia	Males = 88% Mean age=29.5 years	Complete tetra = 21% Incomplete tetra = 31% Complete para = 29% Incomplete para = 18%	Fall: 9.1% (n=28)
Chhabra and Arora 2012 N=1138	India	All patients admitted to an Indian Spinal Injuries Centre 2002 to 2010.	85.5% males Mean age: 34.4 years	AIS A: 71.1% AIS B: 14.7% AIS C:8.2% AIS D: 6.0%	Fall from height: 39.6%
Knutsdottir 2012 N=207	Iceland	1975-2009 Patients admitted to Landspitali University Hospital	Males: 72% Mean Age: 38 years	Cervical: 57% Thoracic/Lumbar: 43%	Falls: 30.9%

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Lenehan et al. 2012 N=930	British Columbia, Canada	1995-2004 Hospital admissions to level 1 trauma center were prospectively collected using a locally designed spine database	Males = 80% Median: 35 years	Cervical: 45.1% Thoracic: 24.5% L/S: 20.9% Unspecified: 9.5%	Fall: 28.5%
Middleton et al. 2012 N=324	New South Wales, Australia	January 2004 to June 2008, Data from Ambulance Service of New South Wales	Males = 85% Mean age = 42 years	Not Specified	High fall: 18.8%% Low fall: 10.8%
Sabre et al. 2012 N=595	Estonia	1997-2007 SCI patients admitted to any Estonia hospitals	Male:Female = 5.5:1 Average age of injury = 39.0 years	C1-C4, AIS, A, B, C = 9.9% C5-C8, AIS, A, B, C = 28.9% T1-S5, AIS , A, B, C = 26.7% All AIS D = 23.9% Unknown = 10.6%	Falls: 41.0%
Wu et al. 2012 N=143	Tianjin, China	Patients admitted to Tianjin Medical University General hospital with diagnosis of tSCI	Mean age 54.6 years Male:Female = 5:1	ASIA A = 5.6% ASIA B = 16.8% ASIA C = 18.9% ASIA D = 58.7%	Low fall = 45.5% High fall = 4.2%
Devivo et al 2011 N=45,442	USA	1935-2008 Persons who were treated at either a SCI Model System or a Shriners Hospital SCI unit	Males= 79.2% Mean age at injury= 32.5 years	19.8% C1-4 32.6% C 5-8 45.4% Paraplegic 2.2% Normal	Falls: 24.5% (n=11,133)
Li et al. 2011 # of patients: N=1079 data collected: N=264	Beijing, China	Patients with acute TSCI admitted to civilian or military hospitals during Jan 1-Dec 31 2002	200 male (76%) Mean age: 41.7 years Range: 6-80 years	Cervical (4.9%) Thoracic (28%) Thoracolumbar, lumbar and lumbosacral (66%)	Falls: (41.3%) n=109

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
McCammon and Ethans 2011 N=553	Manitoba, Canada	1981-1985, 1998-2002, 2003-2007 Inclusion criteria: survival to hospital admission with TSCI, or outpatient referral to an SCI rehabilitation specialist. Exclusion criteria: congenital causes of paralysis such as spina bifida or cerebral palsy as well as acquired paralysis from multiple sclerosis or Guillan-Barre syndrome.	75.8% male Mean Age: 1981-1985: 29.0 years 1998-2002: 35.3 years 2003-2007: 39.8 years	1981-1985: Cervical: 46.2% Thoracic:33.0% Lumbar: 20.9% Sacral:0.0% 1998-2002: Cervical:45.0% Thoracic:33.3% Lumbar: 21.6% Sacral:0.0% 2003-2007: Cervical:51.3% Thoracic:34.9% Lumbar:12.5% Sacral:1.3%	Falls: 81-85: 14.5% 98-02: 16.1% 03-07: 16.4%
Ning et al. 2011 N=869	Tianjin, China	All patients with TSCI aged 15 or older admitted to tertiary hospitals in Tianjin from Jan 1, 2004- Dec 31, 2008	738 male (84.9%) Mean age (sd) 46.0 (14.2)	Cervical (71.5%) Thoracic (13.3%) Lumbar (15.1%) Sacral (0.1%)	Falls: Low fall: (37.6%) n=327 High fall: (19.3%) n=168
Van Den Berg et al. 2011 N=540	Aragon, Spain	Hospitalized from January 1972 to December 2008 for traumatic SCI and received medical care in Aragon following the acute stabilization period, regardless of place of injury and acute care.	79% male, mean age 39.6±17.7 yrs.	36.9% (n=199) cervical 37.4% (n=202) thoracic 19.3% (n=104) lumbar 4.3% (n=23) sacral	Falls (24.6%)
Wu et al. 2011 N=41,586	Taiwan	All SCI patients older than 20 years of age and admitted to medical services from 1998-2008 that were identified using the National Health Insurance Research Database of Taiwan.	62% male (n=25857) 61.2% had traumatic SCI (n=25,439)	Cervical: 51.8% N=21,557 Thoracic: 12.3% N=5,098 Lumbar: 22.9% N=9,533 Other SCI: 13.0% N=5,398	Falls: (34.8%) n=8,851 calculated using N traumatic SCI= 25,439)

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Cosar et al. 2010 N TSCI=127	Turkey	Patients with traumatic SCI who participated in an in-patient rehabilitation program at a tertiary research hospital from 1996-2008.	67.7% (n=86) male mean age 37.81±13.65 years	36 (28.3%)-tetraplegic (C4-T1) 76 (59.8%)-paraplegic (T2–T12) 15 (11.8%) had conus–cauda equina (L1–S4) injury	Falls; (33.9%) n=43
Couris et al. 2010 N=936	Ontario, Canada	The study included all patients aged 18 years or older living in Ontario during the fiscal years 2003–2004 (through 2006–2007) who experienced TSCI.	74.1% (n=694) male mean age: 51.3±20.1 years	65.5% (n=610) cervical 21.3% (n=198) thoracic 10.0% (n=93) lumbar 3.2% (n=30) other	Falls: (49.5%) n=463
Hagen et al. 2010 N=336	Norway (2 counties: Hordaland and Sogn og Fjordane)	Patients who suffered a TSCI from 1952-2001 and lived in Hordaland or Sogn og Fjordane	Male to female ratio was 4:7:1 % of women varied from 6.9-24.4%	Complete (41.4%) Incomplete (58.6%) Cervical (52.4%) Thoracic (29.5%) Lumbar/sacral (18.2%)	Falls: (45.5%) n=153 <1m: 11% 1-5m: 23.2% >5m: 11.6%
NSCISC 2010 N=26852	USA	1973-2009 26 federally funded Model SCI Care Systems and National SCI Database	Male= 80.8% (1973-2009) Mean age at injury = 40.2 years (2005-2009)	2005-2009 Tetraplegia = 55.2% Paraplegia = 44.4 % Complete Tetraplegia = 16.9% Incomplete tetraplegia = 38.3% Complete Paraplegia = 22.9% Incomplete Paraplegia = 21.5%	Falls: 27.3% (n=7331)
Pirouzmand 2010 N=12,192	Toronto, Canada	1986-2006 SCI and SI in Sunnybrook Trauma Registry Database	[SI Male=66% Median age=36 years] SCI Male= 76% Median age=33 years CSCI Median age= 30 years	[Spinal Injury= 23.2% -Cervical= 29% - Thoracic= 21% - Lumbosacral= 50%] SCI= 5.4% - Cervical=29% - Thoracic=21% - Lumbo-sacral = 50% - Multiple Levels= 20% CSCI=3%	Falls: 21.2%

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Qureshi et al. 2010 N=521	Rawalpindi, Pakistan	All patients who suffered a spinal injury from non-disaster causes and were admitted to the Spine Unit of a tertiary care hospital in Pakistan from 2001-2008.	402 male (77%) Mean age (sd) 39.1 (16.17)	Level of injury: Thoraco-lumbar spine (n=369, 71%), lower cervical spine (n=93, 18%), upper cervical spine (n=42, 8%) and sacrum (n=9, 2%). Injuries at multiple levels in 8 (2%)	Fall from height: (62%) n=323
Chabok et al. 2009 N=245	Guilan, Iran	Patients admitted to Poursina Hospital, with TSCI	71.8% male	Neurological status: 15 complete 29 incomplete 201 no neurological damage cervical- n=17 thoracic- n=6 thoracolumbar- n=48 Lumbar= 12	Falls: (43.3%) N=106
Obalum et al. 2009 N=468	Lagos, Nigeria	1992-2006 Registrars at the emergency room and wards from the Lagos University Teaching Hospital (receives the majority of SCI patients in Lagos)	Male=70.1% 66.2% were ages 40 years and below. Peak age incidence = 21-30 years.	ASIA A n=230 ASIA B n=45 ASIA C n=36 ASIA D n=41 ASIA E n= 34 Death n=82 Lumbar n=278 Cervical n=142 Thoracic n=48	Falls: 9.4% (n=44)
Ahoniemi et al. 2008 N=1647	Finland	1976-2005 Register survey; Medical records from registers of Käpylä Rehabilitation Centre	83% male Mean age of injury (M/F): 1976-1985: 34.7/35.8 1986-1995: 36.7/38.3 1996-2005: 42.4/40.4	50.6% tetraplegia 49.4% paraplegia	Falls: 41.2% (n=678)
Macciocchi et al. 2008 N= 298	South-eastern, USA	2004-2005 All patients admitted for traumatic SCI between the ages 16-59. Excluded if unable to speak English.	Male=79% Mean age =28.7±10.1 years.74% of all eligible patients.	C1-4 ASIA A-C, n=9 C1-4 ASIA D, n=5 C5-8 ASIA A-C, n=30 C5-8 ASIA D, n=6 T1-8 ASIA A-C, n=26 T1-8 ASIA D, n=2 T9-12 ASIA A-C,n=15 T9-12ASIA D, n=3 L1-S3 ASIA A-C, n=5	Falls: 10% (n=30)

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
National Spinal Cord Injury Statistical Center 2008 N=25,415	USA	26 federally funded Model SCI Care Systems and National SCI Database	77.8% male (2000-2008) Average age = 39.5 years (2005-2008)	2000-2008 Incomplete tetraplegia: 34.1% Complete paraplegia: 23.0% Complete tetraplegia:18.3% Incomplete paraplegia: 18.5%	Falls: 27.1% (n=6887)
Fassett et al. 2007 N=412	Philadelphia, Pennsyl-vania, USA	1978-2005 Treated in Delaware Valley Regional Spinal Cord Injury Center at Thomas Jefferson University Hospital	≥70 years old. No further demographics given.	High quadriplegic (C4 and above)=42% Paraplegic=22% ASIA A ~ 45% ASIA B ~ 13% ASIA C ~ 15% ASIA D ~ 24%	Falls: 74% (n=305)
Shrestha et al. 2007 N=149	Eastern region, Nepal	2001-2004 Admission to hospital in Dharan with cervical spinal injury.	Males=80% Mean age=40 (6-88) years Mortality=6 (4%)	Frankel levels: A=54 (36%) B=20 (13%) C=22 (15%) D=19 (13%) E=34 (23%)	Falls: 60.4% (n=90)
Pickett et al 2006 N=151	London, Ontario, Canada	1997-2006 Admissions to hospital in London, Ontario with SCI	Male=74.2% Mean age = 42.2 ± 20.9 (9-96) years Mortality=12 (8%)	Cervical=75% Thoracic= 10% Lumbar=9% Junctional=6% Complete=35% Incomplete=65%	Falls: 31.1% (n=47)
Calancie et al. 2005 N=229	Dade County, Florida, USA	Acute traumatic spine and/or spinal cord injury admitted to Jackson Memorial Hospital	Male = 74.6% Average age at injury=40.0±17.5 years 15 were children	ASIA A = 32.8% (75) ASIA B = 4.8% (11) ASIA C = 24.0% (55) ASIA D = 31.5% (72) ASIA E = 7.0% (7.4) Fractures: Cervical = 62% T1-T10 = 15% (35) T11-L4 = 19% (44) Non-fractures: Cervical = 3% (7) Complete = 32.8%	Falls: 19.7% (n=45)

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Dahlberg et al. 2005 N=152	Helsinki, Finland	January 1, 1999 cross-section date Adult citizens (18 years or more) of Helsinki who had permanent sensory or motor deficits because of traumatic SCI (ASIA A–D). ASIA-E cases were excluded.	Males = 76% Average age of injury=47.9 years	Data only for 121 subjects: 46% (n=56) tetraplegia 54% (n=65) paraplegia 57% (n=69) incomplete 43% (n=52) complete	Falls: 43% (n=66)
Gur et al. 2005 N=539	South-eastern Anatolia, Turkey	1990-1999 4 hospitals that were major referral centers for trauma	Average age of injury=30.62 (1-70) years 77.2% (n=416) male 22.6% (n=120) civil servants 20.2% (n=109) housewives 15.0% (n=79) soldiers	29.3% (n=158) incomplete paraplegia 45.1% (n=243) complete paraplegia 13.7% (n=74) incomplete tetraplegia 13.9% (n=75) complete tetraplegia 25.4% (n=137) cervical 36.7% (n=198) thoracic 34.0% (n=183) lumbar	Falls: 31.9% (n=172)
Lakhey et al. 2005 N=233	Dharan, Nepal	May 1997- April 2001 Orthopaedic ward of BP Koirala Institute of Health Schiences	Male=72.5% <20years old=26 individuals (11.1%), 20-30yrs=59 (25.3%), 31-40yrs=49 (21.0%), 41-50yrs=37 (15.9%), >50yrs=62 (26.6%)	cervical = 88 (37.8%) dorsal = 70 (30.0%) lumbar = 72 (30.9%) none bony = 3 (1.3%) complete = 46.8%	Falls: 77.6% (n=181) from trees: 40.3% (n=94) 1st/2nd floor: 27.9% (n=65) Hill slope: 4.7%(n=11) Ladder: 4.7% (n=11)
National Spinal Cord Injury Statistical Center 2005 N=23,683	USA	25 federally funded Model SCI Care Systems and National SCI Database	Male=79.6% Average age of injury=37.6 years 62.9% Caucasian 22% African American 12.6% Hispanic 51.8% single	Incomplete tetraplegia (34.5%) Complete tetraplegia (18.4%) Incomplete paraplegia (17.5%) Complete paraplegia (23.1%)	Falls: 22.9% (n=5423)
Umaru and Ahidjo 2005 N=36	Maiduguri, Nigeria	1998-2002 Admissions to hospital in Maiduguri with SCI. Exclusion Criteria: Cases with inadequate information	Males=83% Mean age =34.3±3 (13-55) years Mortality=3 (8%)	Cervical=14 (39%) Thoracic=10 (28%) Thoracolumbar=10 (28%) Lumbar=2 (6%) Complete=20 (56%) Incomplete=16 (44%)	Falls: 22.2% (n=8)

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Dryden et al. 2003 N=450	Alberta, Canada	1997-2000 Data from the Alberta Ministry of Health and Wellness, records from the Alberta Trauma Registry, and death certificates from the Office of the Medical Examiner	Male=71.6% Median age of injury=35.0 years	61.5% (n=277) cervical 17.3% (n=78) thoracic 17.1% (n=77) lumbar/sacral/cauda equina 4.0% (n=18) unspecified	Falls: 19.1% (n=86)
Krassioukov et al. 2003 N=58	Toronto, Canada	1998-2000 Admissions to hospital in Toronto with traumatic SCI. Exclusion Criteria: Patients admitted with ASIA E.	Group 1 (n=30; Ages 17-59 years) Males=87% Ages 17-59 years: Mean age=38.7 (17-56) years	ASIA A and B=30% ASIA C and D=70%	Falls: 30.% (n=9)
			Group 2 (n=28) Males=61% Ages>60 years: Mean age=73.3 (60-89) years	ASIA A and B=10.7% ASIA C and D=89.3%	Falls: 64.3% (n=18)
Kuptinat-saikul, 2003 N=83	Thailand	1997-2000 All SCI patients admitted to Spinal Unit, Siriraj Hospital, Nagkok.	Males=79.5% Average age =32.3 ±11.7 years.	Falls: Tetraplegic n=2 Paraplegic n=6 ASIA D=6	Falls: 16.9% (n=14)
Pagliacci et al. 2003 N=684	Italy	1997-1999 Rehabilitation admissions to 32 institutions in Italy with traumatic SCI.	Males = 80% Mean age=38.5 (11-94) years.	ASIA Scores: A=346 (50%) B=72 (10%) C=149 (22%) D=94 (14%) E=12 (2%)	Falls: 22.4% (n=153)
Pickett et al. 2003 N=2385	Ontario, Canada	1994-1999 SCI in Ontario Trauma Registry	Males=65% <20 years =89 (9%) 20-39 years= 190 (18%) 40-59 years=245 (24%) ≥60 years=506 (49%)	No details	Falls: 43.2% (n=1030)

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Singh et al. 2003 N=483	Haryana, India	2000-2001 Accident and emergency services and department of Orthopaedic Surgery and Rehabilitation of Pt. B.D. Sharma PGIMS, Rohtak.	Male=74.7% Mean age at injury=35.4 years	164 tetraplegia 283 paraplegia	Falls: 44.5% (n=215)
Catz et al. 2002 N=250	Israel	1959-1992 Traumatic SCI, admitted to the Loewenstein Rehabilitation Center, the major referral center for rehabilitation medicine in Israel.	Males=75.6% Mean age = 34.5 years (range 6-83 years).	High cervical 7.6% low cervical 28.8% thoracic 32.4% lumbar 31.2%	Falls: 16.8% (n=42)
O'Connor, P 2002 N=265	Australia	1998-1999 Australian Spinal Cord Injury Register (ASCIR) for persons 15 years and older. All adult SCI cases are reported to the ASCIR Transient neural deficits were excluded.	Male=76 % No other demographics given	C4 n=47 C5 n=45 C6 n=22 L1 n=30 T12 n=17 Incomplete tetraplegia n=101 Incomplete paraplegia n=64 Complete tetraplegia n=51 Complete paraplegia n=48	Falls: 31% (n=83)
Burke et al. 2001 N=161	Kentucky and Indiana counties, USA	1993-1998 University of Louisville Hospital SCI Trauma Registry and patient medical records	Male=75% Mean age of injury=45.6 years 59.5% single 29.4% married 86.5% White 13.5% African American	43% complete (all cases) 58% Frankel A 17% Frankel B 7% Frankel C 15% Frankel D	Falls: 23% (n=37)
Demetriades et al. 2000 SCI=11	California, USA	1993-1997 Los Angeles County and University of Southern California Medical Center	Male=100% Average age of injury=43.5 years	Not given.	Falls: 27.3% (n=3)

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Karacan et al. 2000 N=581	Turkey	1992 Nation-wide survey of SCI admissions to medical institutions. Exclusion Criteria: Patients who died before hospitalization.	Mean age=35.5±15.1 years. Males=415 (71%) Females=166 (29%)	Cervical=31.7% Thoracic=26.6% Lumbar=25.1% Tetraplegia=87 (32%) Paraplegia=394 (68%)	Falls: 36.5% (n=212)
National Spinal Cord Injury Statistical Center 2000 N=19648	USA	24 federally funded Model SCI Care Systems and National SCI Database	Male=81.7% 55% within 16-30 years old, mean age at injury is 31.8 years	Tetraplegia = 51.7% Paraplegia = 46.7 % Complete Tetraplegia = 18.5% Incomplete tetraplegia = 29.5% Complete Paraplegia = 27.9% Incomplete Paraplegia = 21.3%	Falls: 21.5% (n=4224)
van Asbeck et al. 2000 N=126 (specific data for 113)	Netherlands	1994 Patients with SCI in National Registration system. Further analysis occurred only for cases in which medical records were obtained Exclusion Criteria: Spinal contusions with no or temporary neurological symptoms.	Males=77% <20 years=15 (13%) 21-30 years=28 (25%) 31-60 years=36 (32%) >61=34 (30%) Mortality=18 (16%)	Complete tetraplegia= 26 (23%) Incomplete tetraplegia= 39 (34%) Complete paraplegia= 29 (26%) Incomplete paraplegia= 19 (17%)	Falls: 48.7% (n=55)
Hoque et al. 1999 N=179	Bangladesh	1994-1995 Admissions to rehabilitation centre in Savar, Dhaka with SCI.	Males=88% 10-20 years=19% 20-30 years=42% 30-40 years=20% 40-50 years=15% 50-60 years=4% Mortality=18 (7%)	Tetraplegia=72 (40%) Paraplegia=107 (60%)	Falls from height 42.4% (n=76) Falls while carrying load on head 20.7% (n=37)
Igun et al. 1999 N=68	Plateau State, Nigeria	1984-1997 Radiologically confirmed diagnosis of spinal cord injury.	Male=91.2% Mean age = 30 years.	Cervico-thoracic n=32 Cervico-thoracic n=36 Deaths n=18	Falls: 22.1% (n=15)

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Caldana and Lucca 1998 N=577	Veneto, Italy	1994-1995 New cases of traumatic spinal cord injury and non-traumatic spinal cord disease treated in regional hospitals (small hospitals excluded)	Male = 83.5% Average age (male) = 39.8 years old Average age (female) = 36 years old	Cervical=62 (21 were complete) Thoracic=29 (25were complete) Thoracolumbar (T12-L1)=18(11) Caudal=14(3) Unidentified=1	Falls: 2.2% (n=13)
Farmer et al. 1998 N=1817	USA	1979-1993 Regional Spinal Cord Injury Center of Delaware Valley (RSCICDV)	Male=78.7% Mean age =37.6 years 72.2% White, 23.5% African American, 2.5% Hispanic 35.9% married 16% unemployed	62.4% cervical 26.8% thoracic 10.8% lumbosacral 40.9% complete 59.1% incomplete 25.1 % quadriplegia complete 36.7% quadriplegia incomplete 15.8% paraplegia complete 21.5% paraplegia incomplete	Falls: 26.9% (n=489)
Levy et al. 1998 N=136	Zimbabwe	1988-1994 Admissions to National Rehabilitation Centre with traumatic SCI.	Males=89% Majority were between 20 and 49 years of age	Cervical=69 (51%) Below Cervical=67 (49%)	Falls out of trees: 11% (n=15)
Martins et al. 1998 N= 398	Portugal	1989-1992 2 hospitals that treat all SCI in the central region of Portugal. Including deaths due to SCI and paediatric cases. Cases without neurological lesion, rehospitalization and vertebral lesions were excluded.	Males = 77% Average age = 50.53±21.85 years.	Complete n=220 Incomplete n=176 Deaths = 223	Falls: 37.4% (n=149)
Aung and Masry 1997 N=219	Great Britain	1985-1988 New traumatic admissions to the Midlands Centre for SCI	Male=79%; Average age of 35.5 years. Female=21%; Average age of 44.2 years.	Cervical n=116 Thoracic n=73 Lumbar n=30	Falls: 42.5% (n=93)

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Chen et al. 1997 SCI=1,586	Taiwan	1992-1996 113 hospitals (11 medical centers, 50 regional general hospitals, 52 local general hospitals)	Male=75.0% Average age of injury=46.1 years	49.9% cervical 13.3% thoracic 34.6% lumbar 6.6% (n=105) died after treatment	Falls: 44.1%, (n=699)
Maharaj 1996 N=75	Fiji	1985-1994 Medical records of spinal cord paralysis patients admitted to the Medical Rehabilitation Unit at Tamavua Hospital	Male=87% Mean age=38.3 (6-76) years 10 (13%) Fijian=35% Indian=47%	40 (53%) tetraplegia 35 (47%) paraplegia 46 (61%) complete 29 (39%) incomplete	Falls: 38.7% (n=29)
Karameh-metaglu, 1995 N=152	Istanbul, Turkey	1992 New patients with traumatic SCI, including pediatrics.	115 males. Mean age = 33 years. 72% of patients were under 40.	Tetraplegic n=50 Paraplegic n=102	Falls: 43% (n=65)
Levi et al. 1995 N=353	Stockholm, Sweden	1991-1994 Survey of the regional Stockholm SCI population	Males=81% Average age of injury=31 (3-77) years	41.6% (n=147) cervical 36.0% (n=127) thoracic 14.7% (n=52) lumbar 1.4% (n=5) sacral 39.4% (n=139) complete 59.5% (n=210) incomplete	Falls: 37.1%, (n=131)
Shingu et al. 1995 N=9752	Japan	1990-1992 Survey of nationwide institutions assumed to accept SCI patients. Exclusion criteria: Patients only receiving outpatient services in this period	Males=80.4% Mean age=48.6±19.1 (0.92-96) years.	Frankel levels: A=2518 (25.8%) B=1208 (12.4%) C=1984 (20.3%) D=1761 (18.1%) E=2242 (23.0%) Unknown=39 (0.4%) Cervical=7317 (75.0%) Below cervical=2408 (24.7%) Unknown=27 (0.3%) Complete=61.1%	Falls: 41.8% (n=4076) From height: 69% (n=6729) On level ground: 31% (n=3023)
Silberstein and Rabinovich 1995 N=196	Novosibirsk, Russia	1989-1993 All in patients with SCI admitted to the Department of SCI. Nerve root or plexus injury was excluded.	Males=93.4% Mean age =34.7 years.	Cervical spine C1-2 n=15 C3-7 n=81 Thoracic T1-12 n=54 Lumbar L1-5 n=46	Falls: 26.6% (n=52)

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Hart et al. 1994 N=616	South Africa	1988-1993 All records of SCI from the Natalspruit Spinal Rehabilitation Unit	Male=80%. Males between 15-40 made up the majority of patients	Complete n=404 Incomplete n=212 Cervical spine n=155 Upper thoracic n=135 Lower thoracic n=249 Lumbar spine n=74	Falls: 2.4% (n=15)
Price et al. 1994 N=376	Oklahoma, USA	1988-1990 SCI cases in Oklahoma statewide multilevel surveillance system Exclusion Criteria: Non Oklahoma residents; patients who died at scene; injuries to nerve roots or spinal plexus.	Males=80% <15 years=12 (3%) 15-19 years=66 (18%) 20-29 years=110 (29%) 30-59 years=145 (39%) ≥60 years =43 (11%) Mortality=30 (8%)	Complete tetraplegia=55 (15%), Incomplete tetraplegia=157 (42%) Complete paraplegia=59 (16%), Incomplete paraplegia=105 (28%)	Falls: 19.9% (n=75)
Shingu et al. 1994 N=3465	Japan	1990 Survey of nationwide institutions assumed to accept SCI patients; Exclusion criteria: Traumatic cervical syndrome cases and extradural nerve root; Patients only receiving outpatient services in this year or who obtained injury abroad	Male=81.2% Mean age=44.1 years (sample) Mean age=52.8 years (falls from height) Mean age=61.5 years (falls on level ground)	Falls from height: Cervical=667 (66%) Below cervical=342 (34%) Unknown=3 Falls on level ground: Cervical=356 (88%) Below cervical=48 (12%) Unknown=3	Falls: 41.0% (n=1420) From height: 71% (n=2460) On level ground: 29% (n=1005)
Soopra-manien 1994 N=412	Bucharest, Romania	1992-1993 SCI patients admitted to Dr Gh. Marinescu Hospital	Male=77% 0-40 years =41.3% 41-90 years =58.7% 37.6%labourer 8.7% farmer 18.2% retired	158 cervical 81 thoracic 36 lumbar 47% incomplete Frankel grade A n=134 Frankel grade B n=24 Frankel grade C n=25 Frankel grade D n=73 Frankel grade E n=150	Falls: 59% (n=242)
Stavrev et al. 1994 N=980	Plovdiv Region, Bulgaria	1983-1992 Treatment for SCI at 2 clinics in Plovdiv region	Males=72% ≤20 years=82 (8%) 21-40 years=387 (40%) 41-60 years=298 (30%) 61-70 years=137 (14%) >70 years=76 (8%) Mortality=72 (7%)	Cervical=206 (21%) Thoracic (>T7) =275 (28%) Lumbar=399, (41%) Other=100 (10%) Neurological deficit=409 (42%) No neurological deficit=572 (58%)	Falls: 55.3% (n=542)

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Thurman et al. 1994 N=223	Utah, USA	1989-1991 Utah residents with SCI in Statewide reporting system of the Utah Department of Health, Bureau of Epidemiology.	Male=76% Median age=29 years	128 (57%) tetraplegia 95 (43%) paraplegia 41 (18%) fatal 21 (9%) died before hospital admission 110 (49%) Frankel A/B/C 46 (21%) Frankel D 25 (11%) full neurological function	Falls: 21.1% (n=47)
Woodruff and Baron 1994 N=150	West Virginia, USA	1985-1988 Data collected during the West Virginia Spinal Cord Injury Registry, includes only injured patients surviving until hospitalization	Male= 82% Majority of individuals were between 15-24.	48% tetraplegia 52% paraplegia	Falls: 21% (n=31)
Acton et al. 1993 N=644	Arkansas, USA	1980-1989 Arkansas residents in Arkansas State Spinal Cord Commission registry. Exclusion Criteria: Lesions caused by degenerative disease; people who died at scene.	Males=80% Mean age males=32.4 years Mean age females=35.4 years	Tetraplegia=37 Paraplegia=45 Unknown=4	Falls: 13.4% (n=86)
Dixon et al. 1993 N=164	New Zealand	1988 SCI cases in Health Services Statistics files.	Males=73.2% Males aged 15-29 years=46%	C1-C4=49 (30%) C5-C7=30 (18%) T1-T6=19 (12%) T7-T12-19 (12%)	Falls: 24% (n=39)
Lan et al. 1993 N=99	Hualien county, Taiwan	1986-1990 Treatment of traumatic SCI in 4 hospitals in Hualien county. Exclusion Criteria: People who died before hospitalization; nontraumatic SCI; patients with transient paralysis; non residents of Hualien.	Males=80% Mean age (males)=44 years Mean age (females)=46 years Mortality=10 (10%)	Complete tetraplegia =5 Incomplete tetraplegia = 5 Complete paraplegia =6 Incomplete paraplegia = 7	Falls: 23.3% (n=23)

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
da Paz et al. 1992 N=1255 (SCI=108)	Brazil	1988 36 public hospitals from 7 Brazilian capitals (represents 6.2% of all hospitals and 9.2% of the total hospital bed capacity.	Males=80.6% Mean age= 30.3 (range 6-56) years 5.6% high education	94 (87.0%) complete 61 (64.9%) paraplegia 33 (35.1%) quadriplegia	Falls: 14.8% (n=16)
DeVivo et al. 1992 N=6563	USA	Admissions to Spinal Cord Injury Care Systems within 1 year of injury from: 1978-1980	Males=82.4% Mean age =28.4 years	Frankel grade at discharge: Complete=51.8% Sensory=13.7% Motor nonfunctional=7.2% Motor functional=25.9% Recovered=1.4%	Falls: 20% (n=1313)
		1981-1983	Males=82.7% Mean age =30.5 years	Frankel grade at discharge: Complete=57.2% Sensory=11.7% Motor nonfunctional=7.8% Motor functional=22.5% Recovered=0.8%	Falls: 18.8% (n=1234)
		1984-1986	Males=84.5% Mean age =31.2 years	Frankel grade at discharge: Complete=48.6% Sensory=16.2% Motor nonfunctional=11.0% Motor functional=23.5% Recovered=0.6%	Falls: 22.2% (n=1457)
Dincer et al. 1992 N=1,694	Turkey	1974-1985 SCI patients admitted to Ankara Rehabilitation Centre	Average age of injury=26.8 (1-70) years 75.68% (n=1282) male 19.83% (n=336) agricultural workers 19.95% (n=338) housewives 19.48% (n=330) private industry workers	85.12% (n=1442) complete paraplegia 6.85% (n=116) incomplete paraplegia 4.84% (n=82) complete tetraplegia 3.19% (n=54) incomplete tetraplegia	Falls: 29.51% (n=500)

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Garcia-Reneses et al, 1991 N=1010	Spain	1984-1985 Every traumatic and non traumatic SCI patient in specialized Spanish hospitals	Male=72.4%. Mean age = 41.8 ± 1.2 years.	Sensory-motor incomplete SCI = 49% Complete SCI= 38%	Falls: 27% (n=273)
Goebert et al. 1991 N=59	Hawaii, USA	1987-1989 Traumatic injury Patient at the Rehabilitation Hospital of the Pacific	Male=84.7% Mean age=20.2 years 0-5years=5.2% 16-30 years=44.8% 31-45 years=25.9% 46-60 years= 12.1% 61-90 years=12.1%	High Quad (C1-4)=16.2% Low Quad (C5-8)=45.9% High Thoracic (T1-6)=18.9% Low Thoracic (T7-12)=10.8% Lumbar (L1-5)=8.1% Frankel Grades: Complete (A)=50.8% Motor functional (D)=35.6%	Falls: 27.6% (n=16)
Biering-Sorensen et al. 1990 N=268	Kingdom of Denmark (Denmark, Greenland, Faroe Islands)	January 1975-December 1984 Admission to national specialized rehabilitation hospitals	Male=76.9% 40% within 15-24 years old	Cervical = 136 Thoracic = 76 Lumbar = 56 Complete tetraplegia = 22% Incomplete tetraplegia = 29% Complete paraplegia = 26% Incomplete paraplegia = 23%	Falls to level below: 23% (n=61), Falls to same level: 3% (n=9)
Pedersen et al. 1989 N=27	Greenland	1965-1986 Admissions to rehabilitation hospital in Hornback with traumatic SCI; Patients injured in Greenland.	Males=74% Mean age=33.5 (14-50) years.	Complete tetraplegia=2 Incomplete tetraplegia=4 Complete paraplegia=1 Incomplete paraplegia=2	Falls: 33.3% (n=9)
Ring et al. 1986 N=202	New South Wales, Australia	1977-1978 Admissions to New South Wales hospitals with spinal injury; death certificates that involved spinal injury. 99% of cases had neurological involvement.	Males=81% 15-24 years=84 (42%) 25-44 years=58 (29%) 45-64 years=30 (15%) ≥65 years=15 (7%) Mortality=69 (39%)	Glasgow Outcome Scale: Severe disability=98(49%) Moderate disability=19(9%) Good recovery=13(6%) Not recorded=3(1%)	Falls: 9.4% (n=19)

Falls					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Griffin & Opitz 1985 N=154	Olmsted County, Minnesota, USA	1935-1981 Medical records-linkage system of the Rochester Project at the Mayo Clinic, periodic multi-centre surveys	Male=72% 153 White, 1 Black	56.5% (n=87) cervical 31.8% (n=49) thoracic 9.1% (n=14) lumbar 2.6% (n=4) sacral	Falls: 13.0% (n=20)
Gee and Sinha 1982 N=36	Papua New Guinea	1978-1981 Traumatic injury Patients that stayed in Port Moresby, Lae and Manding hospitals	Male = 88% Mean age = 26years (range 16-41 years)	Cervical = 22% Upper thoracic = 11% Thoraco-lumbar = 28% Lumbar = 39%	Falls from trees: 31% (n=11) Falls from roof : 9% (n=3)

Table 9: Sports and Recreation

Sports - Canada					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Lenehan et al. 2012 N=930	British Columbia, Canada	1995-2004 Hospital admissions to level 1 trauma center were prospectively collected using a locally designed spine database	Males = 80% Median: 35 years	Cervical: 45.1% Thoracic: 24.5% L/S: 20.9% Unspecified: 9.5%	Sports: 17.9%
McCammon and Ethans 2011 N=553	Manitoba, Canada	1981-1985, 1998-2002, 2003-2007 Inclusion criteria: survival to hospital admission with TSCI, or outpatient referral to an SCI rehabilitation specialist. Exclusion criteria: congenital causes of paralysis such as spina bifida or cerebral palsy as well as acquired paralysis from multiple sclerosis or Guillan-Barre syndrome.	75.8% male Mean Age: 1981-1985: 29.0 years 1998-2002: 35.3 years 2003-2007: 39.8 years	1981-1985: Cervical: 46.2% Thoracic:33.0% Lumbar: 20.9% Sacral:0.0% 1998-2002: Cervical:45.0% Thoracic:33.3% Lumbar: 21.6% Sacral:0.0% 2003-2007: Cervical:51.3% Thoracic:34.9% Lumbar:12.5% Sacral:1.3%	Sports: 81-85: 13.6% 98-02: 2.0% 03-07: 5.2%
Pickett et al. 2006 N=151	London, Ontario, Canada	1997-2006 Admissions to hospital in London, Ontario with SCI.	Male=74.2% Mean age = 42.2 ± 20.9 (9-96) years Mortality=12 (8%)	Cervical=75% Thoracic= 10% Lumbar=9% Junctional=6% Complete=35% Incomplete=65%	Sports: 9.3% (n=14)
Tator et al. 2004 N=271	Canada	1943-1999 Survey results from physicians and other sources reporting spinal or spinal cord injury in hockey players. Exclusion Criteria: Minor spinal injuries such as strains, sprains or whiplash.	Males=97% Mean age =20.6 (11-50) years	Known features (n=236): Cervical =83.5% Thoracic=5.1% Thoraco-Lumbar=5.9% Lumbo-sacral=5.5% Complete=58 (21%) Incomplete=58 (21%) Transient neurological symptoms=43 (16%) Root injury only=26 (10%) No neurological deficit=60 (22%) Unknown=26 (10%)	Ice hockey: 100% (n=271)

Sports - Canada					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Dryden et al. 2003 N=450	Alberta, Canada	1997-2000 Data from the Alberta Ministry of Health and Wellness, records from the Alberta Trauma Registry, and death certificates from the Office of the Medical Examiner	Males=71.6% Median age of injury=35.0 years	61.5% (n=277) cervical 17.3% (n=78) thoracic 17.1% (n=77) lumbar/sacral/cauda equina 4.0% (n=18) unspecified	Sports: 11.3% (n=51)
Krassioukov et al. 2003 N=58	Toronto, Canada	1998-2000 Admissions to hospital in Toronto with traumatic SCI. Exclusion Criteria: Patients admitted with ASIA E.	Males=87% Ages 17-59 years: Mean age=38.7 (17-56) years	ASIA A and B=30% ASIA C and D=70%	Sports: 23.3% (n=7)
Koo and Fish 1999 N= 10	British Columbia, Canada	10 consecutive patients with SCI due to snowboarding admitted to Vancouver Hospital and Health Sciences Centre Acute SCI Unit	Males=90% Average age =22.4 (range 16-29) years. Average 6.25 years experience.	cervical facture/dislocation n=1 compression/burst type n=9 50% neurological impairment: 3 complete 2 incomplete	Snow-boarding: 100% (n=10)
Tarazi et al. 1999 N=56	Whistler/ Blackcomb Mountains, Canada	1994-1996 Ski patrol records, the Provincial Trauma Database, and hospital records were reviewed.	Skiers: Males=70% Mean age for =34.5 years, Snowboarders: Mean age for snowboarders=22.4 years, 100% men.	12 had neurological deficits Complete at C2 Complete at T2 Complete at T6 Incomplete at T 12 Cauda equina L1 Central Cord Syn at C4 Central Cord Syn at C7 n=2 Nerve root deficits n=4	Snow-boarding and Skiing: 100% (n=56) Prevalence: 0.01 per 1000 skier-days 0.04 per 1000 snowboarder-days
Tator et al. 1993 N=201	Toronto, Canada	1974-1981 First 220 admissions to Acute Spinal Cord Injury Unit in Toronto. Exclusion Criteria: Admissions >30 days after injury; injuries without cord involvement; nerve root involvement only; penetrating injuries; injuries below L2; Patients who died on scene or upon arrival.	Males=79.6% Mean age=34.5 years Median age=27.0 years	Cervical=63.2%, Thoracic=16.9%, Thoraco-lumbar=19.9% Complete=46.2%, Incomplete=53.8%	Sports: 22.9% (n=46)

Sports - Canada					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Tator et al. 1991 N=117	Canada and USA Canada=110 USA=6 Unknown=1	1966-1987 Survey results from physicians and other sources reporting spinal or spinal cord injury in hockey player. Exclusion Criteria: Minor spinal injuries such as strains, sprains, flexion-extension injuries and whiplash.	Males=96% Mean age=21 (11-47) years Mortality=5 (4%)	Cervical=93 (80%) Thoracic=3 (3%) Thoracolumbar=7 (6%) Lumbosacral=6 (5%) Unknown=8 (7%) Complete=29 (25%) Incomplete=32 (27%) Root injury only=12 (10%) No neurological deficit=28 (24%) Unknown=16 (14%)	Ice Hockey: 100% (n=117)

Sports - USA					
Author Year N	**Geographic region**	**Inclusion/exclusion criteria**	**Study population**	**Injury features**	**Cause (%) / sample**
Devivo et al. 2011 N=45,442	USA	1935-2008 Persons who were treated at either a SCI Model System or a Shriners Hospital SCI unit	Males= 79.2% Mean age at injury= 32.5 years	19.8% C1-4 32.6% C 5-8 45.4% Paraplegic 2.2% Normal	Sports: 10.3% (n=4,681)
Collier et al. 2010 N=3	Shepherd Center, Atlanta, USA.	Admission to the spinal cord injury rehabilitation center and experienced traumatic SCI during skimboarding.	100% (n=3) males mean age: 19.7 years	Case 1: motor incomplete (AIS C) cervical (C4-C5) SCI Case 2: sensory incomplete (AIS B) C4 SCI Case 3: C3-C4 AIS A SCI	Sports: (skiboarding) (100%)
NSCISC 2010 N=26852	USA	1973-2009 26 federally funded Model SCI Care Systems and National SCI Database	Male= 80.8% (1973-2009) Mean age at injury = 40.2 years (2005-2009)	2005-2009 Tetraplegia = 55.2% Paraplegia = 44.4 % Complete Tetraplegia = 16.9% Incomplete tetraplegia = 38.3% Complete Paraplegia = 22.9% Incomplete Paraplegia = 21.5%	Sports: 7.9% (n=2,121)

Sports - USA					
Author Year N	**Geographic region**	**Inclusion/exclusion criteria**	**Study population**	**Injury features**	**Cause (%) / sample**
Macciocchi et al. 2008 N= 298	South-eastern USA	2004-2005 All patients admitted for traumatic SCI between the ages 16-59. Excluded if unable to speak English.	Males=79% Mean age =28.7±10.1 years. 74% of all eligible patients.	C1-4 ASIA A-C, n=9 C1-4 ASIA D, n=5 C5-8 ASIA A-C, n=30 C5-8 ASIA D, n=6 T1-8 ASIA A-C, n=26 T1-8 ASIA D, n=2 T9-12 ASIA A-C, n=15 T9-12ASIA D, n=3 L1-S3 ASIA A-C, n=5	Sports: 13% (n=39)
Fassett et al. 2007 N=412	Philadelphia, Pennsyl-vania, USA	1978-2005 Treated in Delaware Valley Regional Spinal Cord Injury Center at Thomas Jefferson University Hospital	≥70 years old. No further demographics given.	High quadriplegic (C4 and above)=42% Paraplegic=22% ASIA A ~ 45% ASIA B ~ 13% ASIA C ~ 15% ASIA D ~ 24%	Diving: 1% (n=4)
Boden et al. 2006 N=196	USA	1989-2002 Catastrophic cervical injuries in high school and collegiate football programs reported to National Center for Catastrophic Sports Injury Research	Male=100% 150 (76.5%) high school and 46 (23.5%) collegiate. Average age at injury=17 (range 14-28) years	93 (48.2%) permanent neurologic deficit, 100 (51.8%) no residual neurologic deficits 16 (8.2%) C1/C2 level 17 (8.6%) incomplete	American Football: Prevalence: Per 100,000 players: 1.10 in high school 4.72 in college
Injury Prevention Service, Oklahoma Department of Health 2006 SCI=2312	Oklahoma, USA	1988-2003 Admissions to Oklahoma hospitals with SCI due to sports; Patients who died at scene.	Football: Males=100% Ages 15-24 years=68% No mortality	Incomplete tetraplegia=44 Incomplete paraplegia=9	Football: 2.3% (n=53)
Injury Prevention Service, Oklahoma Department of Health 2006 SCI=2312	Oklahoma, USA	1988-2003 Admissions to Oklahoma hospitals with SCI due to sports; Patients who died at scene.	Diving: Males=86.4% Ages 15-24 years=53% Females=12 Mortality=3	Complete tetraplegia=35 Incomplete tetraplegia=47 Incomplete paraplegia=3	Diving: 3.8% (n=88)
Injury Prevention Service, Oklahoma Department of Health 2006 SCI=2312	Oklahoma, USA	1988-2003 Admissions to Oklahoma hospitals with SCI due to sports; Patients who died at scene.	Horseback Riding: Males=66.7% Mortality=2	Complete paraplegia=1 Incomplete tetraplegia=15 Incomplete paraplegia=15	Horse riding: 1.4% (n=33)

Sports - USA					
Author Year N	**Geographic region**	**Inclusion/exclusion criteria**	**Study population**	**Injury features**	**Cause (%) / sample**
Injury Prevention Service, Oklahoma Department of Health 2006 SCI=2312	Oklahoma USA	1988-2003 Admissions to Oklahoma hospitals with SCI due to sports; Patients who died at scene.	Males=86% Age Range: 7-82 years. Mortality=10 (4%)	Survivors: Complete tetraplegia=42 (17%) Complete paraplegia=9 (4%) Incomplete tetraplegia=152 (60%) Incomplete paraplegia=49 (19%)	Sports: 11.3% (n=262) Prevalence: 0.5/100,000/ year
Calancie et al. 2005 N=229	Dade County, Florida, USA	Acute traumatic spine and/or spinal cord injury admitted to Jackson Memorial Hospital	Male = 74.6% Average age at injury =40.0±17.5 years 15 were children	ASIA A = 32.8% (75) ASIA B = 4.8% (11) ASIA C = 24.0% (55) ASIA D = 31.5% (72) ASIA E = 7.0% (7.4) Fractures: Cervical = 62% T1-T10 = 15% (35) T11-L4 = 19% (44) Non-fractures: Cervical = 3% (7) Complete = 32.8%	Diving: 5.2% (n=12)
Calancie et al. 2005 N=229	Dade County, Florida, USA	Acute traumatic spine and/or spinal cord injury admitted to Jackson Memorial Hospital	Male = 74.6% (175) Female = 24% (54); Average age at injury=40.0±17.5 years 15 were children	ASIA A = 32.8% (75) ASIA B = 4.8% (11) ASIA C = 24.0% (55) ASIA D = 31.5% (72) ASIA E = 7.0% (7.4) Fractures: Cervical = 62% T1-T10 = 15% (35) T11-L4 = 19% (44) Non-fractures: Cervical = 3% (7) Complete = 32.8%	Sports: 3.5% (n=8) Bicycle 2.6% (n=6) Water-related 2.6% (n=6)
National Spinal Cord Injury Statistical Center 2005 N=23,683	USA	2000-2005 National Spinal Cord Injury Database from 25 Model SCI Care Systems	Males=79.6% Average age of injury=37.6 years 62.9% Caucasian 22% African American 12.6% Hispanic 51.8% single	Incomplete tetraplegia (34.5%) Complete tetraplegia (18.4%) Incomplete paraplegia (17.5%) Complete paraplegia (23.1%)	Sports: 8.9% (n=2108)
Cantu and Mueller 2003 N=223	USA	1977-2001 All permanent cervical spinal cord injury collected at national level from all organized football Programs National Center for Catastrophic Sports Injury Research	Males=100% 183 high school, 29 college, 7 professional, 4 sandlot 71% playing defense 69% tackles	Fracture/dislocation = 176 (79%) Cord contusion = 31 (14%) Acute disc rupture = 11 (5%)	American Football: Prevalence: Per 100,000 players: 1991-2001 0.52 in high school 1.55 in college 14 in professional

Sports - USA					
Author Year N	**Geographic region**	**Inclusion/exclusion criteria**	**Study population**	**Injury features**	**Cause (%) / sample**
National Spinal Cord Injury Statistical Center 2000 N=19648	USA	1973 -1990's 24 federally funded Model SCI Care Systems and National SCI Database	Males=81.7% 55% within 16-30 years old, mean age at injury is 31.8 years	Tetraplegia = 51.7% Paraplegia = 46.7 % Complete Tetraplegia = 18.5% Incomplete tetraplegia = 29.5% Complete Paraplegia = 27.9% Incomplete Paraplegia = 21.3%	Sports: 7.1% (n=1395)
Nobunaga et al. 1999 N=25,054	USA	1973-1998 Admissions to a Model Spinal Cord Injury Care System within 365 days of injury.	Males=81.5% Mean age =32.3±15.8 years.	Complete tetraplegia=44.0% Incomplete tetraplegia=45.1% Complete paraplegia=5.4% Incomplete tetraplegia=4.9%	Sports: 11.1% (n=2781)
Price et al. 1994 N=376	Oklahoma, USA	1988-1990 SCI cases in Oklahoma statewide multilevel surveillance system Exclusion Criteria: Non Oklahoma residents; patients who died at scene; injuries to nerve roots or spinal plexus.	Males=80% 15-19 years=66 (18%) 20-29 years=110 (29%) 30-59 years=145 (39%) ≥60 years =43 (11%) Mortality=30 (8%)	Complete tetraplegia=55 (15%), Incomplete tetraplegia=157 (42%) Complete paraplegia=59 (16%), Incomplete paraplegia=105 (28%)	Sports: 11.1% (n=42) Diving (43%) Horse riding (19%) Football (17%) Other (21%)
Thurman et al. 1994 N=223	Utah, USA	1989-1991 Utah residents with SCI in Statewide reporting system of the Utah Department of Health, Bureau of Epidemiology.	Males=76% Median age=29 years	128 (57%) tetraplegia 95 (43%) paraplegia 41 (18%) fatal 21 (9%) died before hospital admission 110 (49%) Frankel A/B/C 46 (21%) Frankel D 25 (11%) returned to full neurological function	Diving: 4.9% (n=11)
Thurman et al. 1994 N=223	Utah, USA	1989-1991 Utah residents with SCI in Statewide reporting system of the Utah Department of Health, Bureau of Epidemiology.	Males=76% Median age=29 years	128 (57%) tetraplegia 95 (43%) paraplegia 41 (18%) fatal 21 (9%) died before hospital admission 110 (49%) Frankel A/B/C 46 (21%) Frankel D 25 (11%) returned to full neurological function	Sports: (excluding diving) 10.8% (n=24)

Sports - USA					
Author Year N	**Geographic region**	**Inclusion/exclusion criteria**	**Study population**	**Injury features**	**Cause (%) / sample**
Woodruff and Baron 1994 N=150	West Virginia, USA	1985-1988 Data collected during the West Virginia Spinal Cord Injury Registry, includes only injured patients surviving until hospitalization	Male= 82% Majority of individuals were between 15-24.	56% tetraplegia 44% paraplegia	Sports: 8% (n=12)
Acton et al. 1993 N=644	Arkansas, USA	1980-1989 Arkansas residents in Arkansas State Spinal Cord Commission registry. Exclusion Criteria: Lesions caused by degenerative disease; people who died at scene.	Males=80% Mean age males=32.4 years Mean age females=35.4 years	Tetraplegia=61 Paraplegia=9	Diving: 8.5% (n=55)
Acton et al. 1993 N=644	Arkansas, USA	1980-1989 Arkansas residents in Arkansas State Spinal Cord Commission registry. Exclusion Criteria: Lesions caused by degenerative disease; people who died at scene.	Males=80% Mean age males=32.4 years Mean age females=35.4 years	Tetraplegia=61 Paraplegia=9	Sports: 11.3% (n=73) Prevalence: 6.15/million/yr (males) 0.53/million/yr (females)
DeVivo et al. 1992 N=6563	USA	Admissions to Spinal Cord Injury Care Systems within 1 year of injury from: 1978-1980 N=1784	Mean age=28.4 years Males=82.4% Females=17.6%	Frankel grade at discharge: Complete=51.8% Sensory=13.7% Motor nonfunctional=7.2% Motor functional=25.9% Recovered=1.4%	Sports: 15.0% (n=268)
		1981-1983 N=1391	Males=82.7% Mean age=30.5 years	Frankel grade at discharge: Complete=57.2% Sensory=11.7% Motor nonfunctional=7.8% Motor functional=22.5% Recovered=0.8%	Sports: 13.7% (n=191)

Sports - USA					
Author Year N	**Geographic region**	**Inclusion/exclusion criteria**	**Study population**	**Injury features**	**Cause (%) / sample**
		1984-1986 N=1433	Males=84.5% Mean age=31.2 years	Frankel grade at discharge: Complete=48.6% Sensory=16.2% Motor nonfunctional=11.0% Motor functional=23.5% Recovered=0.6%	Sports: 14.4% (n=206)
Goebert et al. 1991 N=59	Hawaii, USA	1987-1989 Traumatic injury Patient at the Rehabilitation Hospital of the Pacific	Male=84.7% Mean age =20.2 years 0-15years=5.2% 16-30 years=44.8% 31-45 years=25.9% 46-60 years= 12.1% 61-90 years=12.1%	High Tetraplegia (C1-4)=16.2% Low Tetraplegia (C5-8)=45.9% High Thoracic (T1-6)=18.9% Low Thoracic (T7-12)=10.8% Lumbar (L1-5)=8.1% Frankel Grades: Complete (A)=50.8% Motor functional (D)=35.6%	Sports: 19.0% (n=11) Diving: (64%) Surfing: (9%)
Tator et al. 1991 N=117	Canada and USA Canada=110 USA=6 Unknown=1	1966-1987 Survey results from physicians and other sources reporting spinal or spinal cord injury in hockey player. Exclusion Criteria: Minor spinal injuries such as strains, sprains, flexion-extension injuries and whiplash.	Males=96% Mean age=21 (11-47) years Mortality=5 (4%)	Cervical=93 (80%) Thoracic=3 (3%) Thoracolumbar=7 (6%) Lumbosacral=6 (5%) Unknown=8 (7%) Complete=29 (25%) Incomplete=32(27%) Root injury only=12 (10%) No neurological deficit=28 (24%) Unknown=16 (14%)	Ice Hockey: 100% (n=117)
Torg et al. 1990 N=979	USA	1976-1987 National Football Head and Neck Injury Registry Note: Rules prohibiting head first tackling and blocking introduced in 1976.	(n=720): Male= 100% No details given.	Cervical spine fractures/subluxations /dislocations=720 158 (21.9%) of these injuries resulted in tetraplegia.	American Football: 73.5% (n=720) Prevalence: Per 100,000 players/1987 SCI: 2.3 Tetraplegia: 0.73
Ditunno et al. 1985 N=56	Philadelphia, USA	Traumatic onset of SCI, aged 16-50 without brain trauma.	Males=94.3% 53% of the subjects were between 20-29 years of age.	Not given.	Sports: 14% (n=8)

Sports - USA					
Author Year N	**Geographic region**	**Inclusion/exclusion criteria**	**Study population**	**Injury features**	**Cause (%) / sample**
Griffin and Opitz 1985 N=154	Olmsted County, Minnesota, USA	1935-1981 Medical records-linkage system of the Rochester Project at the Mayo Clinic, periodic multi-centre surveys	Males=72% 153 White, 1 Black	56.5% (n=87) cervical 31.8% (n=49) thoracic 9.1% (n=14) lumbar 2.6% (n=4) sacral	Sports: 7.8% (n=12)

Sports-Europe					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Alshahri et al. 2012 N=307	Riyadh, Saudi Arabia	2003 to 2008 Traumatic SCI, admitted to Riyadh Military Hospital in Saudi Arabia	Males = 88% Mean age=29.5 years	Complete tetra = 21% Incomplete tetra = 31% Complete para = 29% Incomplete para = 18%	Diving: 1% (n=3)
Knutsdottir 2012 N=207	Iceland	1975-2009 Patients admitted to Landspitali University Hospital	Males: 72% Mean Age: 38 years	Cervical: 57% Thoracic/Lumbar: 43%	Sports: 18.8%
Cosar et al. 2010 N TSCI=127	Turkey	Patients with traumatic SCI who participated in an in-patient rehabilitation program at a tertiary research hospital from 1996-2008.	67.7% (n=86) male mean age 37.81±13.65 years	36 (28.3%)-tetraplegic (C4-T1) 76 (59.8%)-paraplegic (T2–T12) 15 (11.8%) had conus–cauda equina (L1–S4) injury	Sports: (non-diving) (0.6%) n=1
Hagen et al. 2010 N=336	Norway (2 counties: Hordaland and Sogn og Fjordane)	Patients who suffered a TSCI from 1952-2001 and lived in Hordaland or Sogn og Fjordane	Male to female ratio was 4:7:1 % of women varied from 6.9-24.4%	Complete (41.4%) Incomplete (58.6%) Cervical (52.4%) Thoracic (29.5%) Lumbar/sacral (18.2%)	Sports: (8.6%) n=29 swimming 2.7% skiing 3.9% Other 2.1%

Sports-Europe					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Bohu et al. 2009 N=37	France	1996-2006 French Rugby Union seasons All permanently disabling cervical spine injuries	Males=100% 21 adults over 21 years, 12 juniors 17-21 years. Average age at injury = 25.1 years	ASIA A (n=27, 73%) ASIA B (n=4, 11%) ASIA C (n=5, 14%) ASIA D (n=1, 3%)	Rugby: 100% (n=37) Prevalence: Per 100,000 players: 2.1 from 1996-1997 1.4 from 2005-2006
Ahoniemi et al. 2008 N=1647	Finland	1976-2005 Register survey; Medical records from registers of Käpylä Rehabilitation Centre	Males= 83% Mean age of injury (M/F): 1976-1985: 34.7/35.8 1986-1995: 36.7/38.3 1996-2005: 42.4/40.4	50.6% tetraplegia 49.4% paraplegia	Diving: 6.6% (n=109)
Franz et al. 2008 N=73	Bern, Switzerland	2000-2006 Admissions >16 years to hospital with severe spinal injuries Exclusion Criteria: Transient neurological symptoms excluded (<2 mins)	Skiing (n=63): Males=73% Median age=40 years Mortality=2 (3%) Snowboarding (n=10) Males=100% Median age=22.5 years	Tetraplegia=5 Paraplegia=3 No persistent neurological deficits=7 No persistent neurological deficits	Skiing: 86.3% (n=63) Snowboarding: 13.7% (n=10)
Dahlberg et al. 2005 N=152	Helsinki, Finland	January 1, 1999 cross-section date Adult citizens (18 years or more) who had permanent sensory or motor deficits (ASIA A–D). ASIA-E cases were excluded.	Male=76% Average age of injury=47.9 years	Data only for 121 subjects: 46% (n=56) tetraplegia 54% (n=65) paraplegia 57% (n=69) incomplete 43% (n=52) complete	Diving: 9.2% (n=14)
Pagliacci et al. 2003 N=684	Italy	1997-1999 Rehabilitation admissions to 32 institutions in Italy with traumatic SCI.	Males = 80% Mean age=38.5 (11-94) years.	ASIA Scores: A=346 (50%) B=72 (10%) C=149 (22%) D=94 (14%) E=12 (2%)	Sports: 7.9% (n=54)
Schmitt and Gerner 2001 N=1,016	Heidelberg, Germany	1985-1997 All traumatic SCI at Orthopedic Department at the University of Heidelberg	Male = 83% Average age for sports accident =26.8, range (9-52) years.	Sport accidents Complete para n=18 Incomplete para n=16 Complete tetra n=21 Incomplete tetra n=14	Sports: (excluding diving) 6.8% (n=69)

Sports-Europe					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Karacan et al. 2000 N=581	Turkey	1992 Nation-wide survey of SCI admissions to medical institutions. Exclusion Criteria: Patients who died before hospitalization.	Males=71% Mean age=35.5±15.1 years.	Cervical=31.7% Thoracic=26.6% Lumbar=25.1% Tetraplegia=87 (32%) Paraplegia=394 (68%)	Diving: 1.2% (n=7)
Ravaud et al. 2000 N=1668	France	1995-1996 Self-administered questionnaire survey at 35 specialized Rehabilitation Centres	Males=93% Mean age at injury=22.2 years	4.9% C1-C2 22.1% C3 40.4% C4 17.3% C5 12.5% C6 2.8% C7-C8 63.1% complete	Diving: 6.5% (n=108)
Ravaud et al. 2000 N=1668	France	1995-1996 Self-administered questionnaire survey at 35 specialized Rehabilitation Centres	Males = 94% Mean age of injury=26.2 years	6% C1-C2 20.9% C3 32.8% C4 25.7% C5 14.2% C6 0.4% C7-C8 52.5% complete	Sports: 15.8% (n=264)
van Asbeck et al. 2000 N=126 (specific data for 113)	Netherlands	1994 Patients with SCI in National Registration system and with obtainable medical records. Exclusion Criteria: Spinal contusions with no or temporary neurological symptoms.	Males = 77% <20 years=15 (13%) 21-30 years=28 (25%) 31-60 years=36 (32%) >61=34 (30%) Mortality=18 (16%)	Complete tetraplegia =26 (23%) Incomplete tetraplegia =39 (34%) Complete paraplegia =29 (26%) Incomplete paraplegia =19 (17%)	Sports: 8.8% (n=10)
Molsa et al. 1999 N=16	Finland and Sweden	1980-1996 Ice hockey related SCI. Excluded transient neurological deficits	Males=100% Mean age =21.2 years	Tetraplegia n=10 Paraplegia n=6	Ice Hockey: 100% (n=16) Prevalence 0.011 per 1000 hockey players
Caldana and Lucca 1998 N=127	Veneto, Italy	1994-1995 New cases of traumatic spinal cord injury and non-traumatic spinal cord disease treated in regional hospitals (small hospitals excluded)	Male = 83.5% Average age (male) = 39.8 years old Average age (female) = 36 years old	Cervical=62 (21 were complete) Thoracic=29 (25were complete) Thoracolumbar (T12-L1)=18(11) Caudal=14(3) Unidentified=1	Sports: 1% (n=8)

Sports-Europe					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Aung and Masry 1997 N=219	Great Britain	1985-1988 New traumatic admissions to the Midlands Centre for SCI	Male = 79% Average age (male) = 35.5 years. Average age (female) = 44.2 years.	Cervical n=116 Thoracic n=73 Lumbar n=30	Sports: 7.3% (n=16)
Exner and Meinecke 1997 N= 22,212	Germany	1976-1996 All traumatic and non-traumatic SCI	72% male	62% paraplegic 38% tetraplegic	Diving: 4% (n=856)
Exner and Meinecke 1997 N= 22,212	Germany	1976-1996 All traumatic and non-traumatic SCI	72% male	62% paraplegic 38% tetraplegic	Sports: 4% (n=853)
Soopra-manien 1994 N=412 (SCI=270)	Bucharest, Romania	1992-1993 SCI patients admitted to Dr Gh. Marinescu Hospital	Male=77% 0-40 years =41.3% 41-90 years =58.7% 37.6%labourer 8.7% farmer 18.2% retired	158 cervical 81 thoracic 36 lumbar 47% incomplete Frankel grade A n=134 Frankel grade B n=24 Frankel grade C n=25 Frankel grade D n=73 Frankel grade E n=150	Diving: 7% (n=29)
Garcia-Reneses et al, 1991 N=1010	Spain	1984-1985 Every traumatic and non traumatic SCI patient in specialized Spanish hospitals	Male = 72.4% Mean age = 41.8 ± 1.2 years.	Sensory-motor Incomplete SCI = 49% Complete SCI= 38%	Sports: 4% (n=40)
Biering-Sorensen et al. 1990 N=268	Kingdom of Denmark (Denmark, Greenland, Faroe Islands)	January 1975-December 1984 Admission to national specialized rehabilitation hospitals	Male=76.9% 40% within 15-24 years old	Cervical = 136 Thoracic = 76 Lumbar = 56 Complete tetraplegia = 22% Incomplete tetraplegia = 29% Complete paraplegia = 26% Incomplete paraplegia = 23%	Diving: 6% (n=15)

Sports-Europe					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Biering-Sorensen et al. 1990 N=268	Kingdom of Denmark (Denmark, Greenland, Faroe Islands)	January 1975-December 1984 Admission to national specialized rehabilitation hospitals	Males = 76.9% 40% within 15-24 years old	Cervical = 136 Thoracic = 76 Lumbar = 56 Complete tetraplegia = 22% Incomplete tetraplegia = 29% Complete paraplegia = 26% Incomplete paraplegia = 23%	Sports: (excluding diving) 6% (n=15)
Pedersen et al. 1989 N=27	Greenland	1965-1986 Admissions to rehabilitation hospital in Hornback with traumatic SCI; Patients injured in Greenland.	Males=74% Mean age=33.5 (14-50) years.	Sports: Incomplete tetraplegia n=1	Sports: 3.7% (n=1)

Sports-Asia					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Hua et al. 2013 N=561	China	Retrospective review of individuals who were treated at The General Hospital of Chinese People's Armed Police Forces	Males = 79.9% Mean Age = 31.85 years	Not Specified	1.1%
Ibrahim et al. 2013 N=292 (traumatic and non)`	Kuala Lumpur, Malaysia	2006-2009 Admitted to the Department of Rehabilitation Medicine, Hospital Kuala Lumpur	Males = 77% Mean age = 39 years	Tetraplegia: 37% (108) Paraplegia: 63% (180)	Traumatic: Sports: 2%

Sports-Asia					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Wang et al. 2013 N=761	Anhui Province, China	All patients admitted to two hospitals within Anhui Province, China between January 2007 and December 2010.	Males = 77.3% Mean age = 45 years	Cervical (46.3%) Thoracic (20.4%) Lumbrosacral (33.3%)	Other (sports and assault): 8.1%
Wu et al. 2012 N=143	Tianjin, China	Patients admitted to Tianjin Medical University General hospital with diagnosis of tSCI	Mean age 54.6 years Male:Female = 5:1	ASIA A = 5.6% ASIA B = 16.8% ASIA C = 18.9% ASIA D = 58.7%	Sports: 4.2%
Li et al. 2011 # of patients: N=1079 data collected: N=264	Beijing, China	Patients with acute TSCI admitted to civilian or military hospitals during Jan 1- Dec 31 2002	200 male (76%) Mean age: 41.7 years Range: 6-80 years	Cervical (4.9%) Thoracic (28%) Thoracolumbar, lumbar and lumbosacral (66%)	Sports: (1.1%) n=3
Ning et al. 2011 N=869	Tianjin, China	All patients with TSCI aged 15 or older admitted to tertiary hospitals in Tianjin from Jan 1, 2004- Dec 31, 2008	738 male (84.9%) Mean age (sd) 46.0 (14.2)	Cervical (71.5%) Thoracic (13.3%) Lumbar (15.1%) Sacral (0.1%)	Sports: (0.2%) n=2
Ye et al. 2009 N=57	Beijing, China	1993-2006 Admission to 6 institutions in Beijing with SCI due to sports and recreation.	Males=77% Mean age =24.5 ±11.9 years Mortality=2 (3.5%)	ASIA A=32 (56%) ASIA B=19 (33%) ASIA C= 5 (9%) ASIA D= 1 (2%) Ratio of complete to incomplete: 1:2.1	Sports: 100% (n=57) Water sports (65%) Gymnastics (9%) Ball game (7%) Casual play (5%) Dancing (5%) Other (9%)

Sports-Asia					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Shrestha et al. 2007 N=149	Eastern region, Nepal	2001-2004 Admission to hospital in Dharan with cervical spinal injury.	Males= 80% Mean age=40 (6-88) years Mortality=6 (4%)	Frankel levels: A=54 (36%) B=20 (13%) C=22 (15%) D=19 (13%) E=34 (23%)	Sports: 2.0% (n=3)
Yamakawa et al. 2001 N=324 SCI=26	Okumino skiing area, Gifu prefecture, Japan	1988-2000 Admissions with ski or snowboard related spinal injuries to hospital in Okumino ski area.	Males=67% Mean age= 26.7 (4-62) years Beginner=27 (31%) Intermediate/ Expert=59 (69%)	Cervical=7 Lumbar=2	Skiing: (n=86) (SCI=9) Prevalence: SCI 0.42/100,000 Spinal Injury 5.73/100,000 visits
			Males=68% Mean age=22.3 (11-46) years Beginner=105 (44%) Intermediate/ Expert=133 (56%)	Cervical=14 Thoracic=2 Lumbar=1	Snowboarding: (n=238) (SCI=17) Prevalence: SCI 0.69/100,000 Spinal Injury 0.073/100,000
Chen et al. 1997 SCI=1,586	Taiwan	1992-1996 113 hospitals (11 medical centers, 50 regional general hospitals, 52 local general hospitals)	Male = 75% Average age of injury=46.1 years	49.9% cervical 13.3% thoracic 34.6% lumbar 6.6% (n=105) died after treatment	Sports: 1.2% (n=19)
Otom et al. 1997 N=151	Jordan	1988-1993 Royal Jordanian Rehabilitation Centre (RJRC) King Hussein Medical Centre (KHMC)	Males = 85.4% Average age of injury=33 years	Cervical=31.8% (n=48) Thoraco-lumbar= 68.2% (n=103) Frankel A= 53.6% (n=81) Frankel B = 10% (n=15) Frankel C =22.5% (n=34) Frankel D= 13.9% (n=21)	Sports: 2.6% (n=4)

Sports-Asia					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Shingu et al. 1995 N=9752	Japan	1990-1992 Survey of nationwide institutions assumed to accept SCI patients. Exclusion criteria: Patients only receiving outpatient services in this period	Males=80.4% Mean age=48.6±19.1 (0.92-96) years	Frankel levels: A=2518 (25.8%) B=1208 (12.4%) C=1984 (20.3%) D=1761 (18.1%) E=2242 (23.0%) Unknown=39 (0.4%) Cervical=7317 (75.0%) Below cervical=2408 (24.7%) Unknown=27 (0.3%) Complete=61.1%	Skiing: 0.7% (n=71) Rugby: 0.7% (n=67) Diving: 1.2% (n=114) Sports: 5.4% (n=528)
Silberstein and Rabinovich 1995 N=196	Novosibirsk, Russia	1989-1993 All in patients with SCI admitted to the Department of SCI. Nerve root or plexus injury was excluded.	Males = 93.4% Mean age =34.7 years.	Cervical spine C1-2 n=15 C3-7 n=81 Thoracic T1-12 n=54 Lumbar L1-5 n=46	Sports: 23.8% (n=47)
Shingu et al. 1994 N=3465	Japan	1990 Survey of nationwide institutions assumed to accept SCI patients; Exclusion criteria: Traumatic cervical syndrome cases and extradural nerve root; Patients only receiving outpatient services in this year or who obtained injury abroad	Male (overall) =81.2% Mean age (sports) =26.1 years	Cervical=158 (87%) Below cervical=24 (13%)	Skiing: 0.6% (n=20) Rugby: 0.7% (n=24) Diving: 1.3% (n=44) Sports: 5.3% (n=182)
Lan et al. 1993 N=99	Hualien county, Taiwan	1986-1990 Treatment of traumatic SCI in 4 hospitals in Hualien county. Exclusion Criteria: People who died before hospitalization; nontraumatic SCI; patients with transient paralysis; non residents of Hualien.	Males= 80% Mean age (males)=44 years Mean age (females)=46 years Mortality=10 (10%)	Complete tetraplegia=2 Incomplete tetraplegia=2 Incomplete paraplegia=2	Sports: 6.1% (n=6)

Sports-Asia					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Chen et al. 1985 N=560	Taipei, Taiwan	1978-1981 All record from general hospitals in Taipei. Included all spinal cord lesion with or without vertebral injury.	Males = 86% Mean age = 35.9 (range 20-49) years.	Incomplete Paraplegia n=118 Complete paraplegia n=180 Incomplete Tetraplegia n=117 Complete Tetraplegia n=145 Death n=31	Sports: 3.7% (n=21)

Sports-Oceania					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Middleton et al. 2012 N=324	New South Wales, Australia	January 2004 to June 2008, Data from Ambulance Service of New South Wales	Males = 85% Mean age = 42 years	Not Specified	Sports: 8.3% Water-related: 13.3%
Quarrie et al. 2007 N=77	New Zealand	1976-2005 Spinal injury claims due to rugby in Accident Compensation Corporation database Note: Mandatory education program for rugby players started in 2001.	No details	No details	Rugby: 100% (n=77) Prevalence: Per 100,000 players Scrum related: 1.4 (1996-2000) 0.2 (2001-2005) Other related 1.3 (1996-2000) 1.1 (2001-2005)
Berry et al. 2006 N=54	New South Wales, Australia	1986-2003 rugby seasons Acute cervical spinal cord injury resulting in tetraplegia and admission to NSW spinal units Australian Spinal Cord Injury Register (ASCIR)	Males=100% 89% adults Median age 24 (range 15-38) years	Complete tetra (n=24, 44%) Incomplete tetra (n=30, 56%)	Rugby Union: 57.4% (n=31): Prevalence: Per 100,000 players: 9.2 from 1986-1991 6.8 from 1995-2003
Carmody et al. 2005	Australia	1997-2002 All acute, Football related SCI (lasting)	Males = 100% 45 adults, 7 schoolboys.	Frankel grade A n=12 Frankel grade B n=1	Rugby: 66% (n=34)

Sports-Oceania					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
N=52		from 6 SCI units that were major referral centers for SCI	Average age at injury=24.4 (RU), 25.9 (RL), 23.4 (ARF), 26.0 (soccer)	Frankel grade C n=2 Frankel grade D n=24 Frankel grade E n=11	Australian Football 26% (n=14) Soccer 8% (n=4) Prevalence: Per 100,000 players: Rugby: 4.7 8.7 cases per year of football-related SCI
Roe et al. 2003 N=34	New South Wales, Australia	1976-1996 Admissions to 2 SCI units in Sydney due to horse riding.	Males=62% Mean age= 39.3±18.4 years Mean years of riding experience= 25.7±21.8	Cervical=15 (44%) Thoracic=8 (24%) Lumbro-sacral=11 (32%) Complete=13 (38%) Incomplete=21 (62%)	Horse riding: 100% (n=34)
Spinecare Foundation 2003 N=80	Queensland and New South Wales, Australia	1986-1996 All acute, Football related SCI (lasting) from 6 SCI units that were major referral centers for SCI	Males = 100% Average age at injury =23.5 (15-49) years; 62 adults, 18 schoolboys.	C4/5 or C5/6 n=38 Frankel grades A B C n=42 Frankel grade D n=24 Frankel grade F n=8 37 complete 43 incomplete T11 n=1 Deaths n=6	Rugby: 100% (n=80) Prevalence: Per 100,000 players: 5.9 7.3 cases per year of rugby related SCI
O'Connor 2002 N=265	Australia	1998-1999 Australian Spinal Cord Injury Register (ASCIR) for persons 15 years and older. All adult SCI cases are reported to the ASCIR Transient neural deficits were excluded.	76 % male No other demographics given	C4 n=47 C5 n=45 C6 n=22 L1 n=30 T12 n=17 Incomplete tetraplegia n=101 Incomplete paraplegia n=64 Complete tetraplegia n=51 Complete paraplegia n=48	Sports: 5% (n=13)
Rotem et al. 1998 N=115	New South Wales (NSW), Australia	1984-1996 Admission to 2 SCI units in Sydney with cervical spinal injuries from rugby union and league football. Exclusion Criteria: Patients transferred from outside NSW	Males = 100% Median age = 22 (14-37) years Mortality=2 (2%)	Complete tetraplegia: 26 (46%) C2-3=1 C3-4=2 C4-5=14 C5-6=6 C6-7=3	Rugby Union: 48.7% (n=56) Prevalence: Tetraplegia/ 10,000/player/year 1.2 (1984-87) 0.3 (1988-91) 0.5 (1992-96)

Sports-Oceania					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
				Complete tetraplegia: 23 (39%) C3-4=2 C4-5=8 C5-6=6 C6-7=6 Unknown level=1	Rugby League: 51.3% (n=59) Prevalence: Tetraplegia/ 10,000/player/year 0.2 (1984-87) 0.2 (1988-91) 0.1 (1992-96)
Maharaj 1996 N=75	Fiji	1985-1994 Medical records of spinal cord paralysis patients admitted to the Medical Rehabilitation Unit at Tamavua Hospital	Males = 87% Mean age=38.3 (6-76) years 10 (13%) female 45 (60%) Fijian 26 (35%) Indian	Tetraplegia = 53% (n=40) Paraplegia=47% (n= 35) Complete = 61% (n= 46) Incomplete=39% (n= 29)	Sports: 20% (n=15)
Dixon et al. 1993 N=164	New Zealand	1988 SCI cases in Health Services Statistics files.	Males=73.2% Males aged 15-29 years=46%	C1-C4=49 (30%) C5-C7=30 (18%) T1-T6=19 (12%) T7-T12-19 (12%)	Sports: 11% (n=18)
Ring et al. 1986 N=202	New South Wales, Australia	1977-1978 Admissions to New South Wales hospitals with spinal injury; death certificates that involved spinal injury. 99% of cases had neurological involvement.	Males=81% ≤1 years=2 (1%) 2-14 years=13 (6%) 15-24 years=84 (42%) 25-44 years=58 (29%) 45-64 years=30 (15%) ≥65 years=15 (7%) Mortality=69 (39%)	Glasgow Outcome Scale: Severe disability=98(49%) Moderate disability=19(9%) Good recovery=13(6%) Not recorded=3(1%)	Diving/ Swimming: 9.4% (n=19)
Ring et al. 1986 N=202	New South Wales, Australia	1977-1978 Admissions to New South Wales hospitals with spinal injury; death certificates that involved spinal injury. 99% of cases had neurological involvement.	Males=81% 15-24 years=84 (42%) 25-44 years=58 (29%) 45-64 years=30 (15%) ≥65 years=15 (7%) Mortality=69 (39%)	Glasgow Outcome Scale: Severe disability =98(49%) Moderate disability =19(9%) Good recovery =13(6%) Not recorded =3(1%)	Sports (excluding diving): 9.4% (n=19)

Sports-Oceania					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Gee and Singha 1982 N=36	Papua New Guinea	1978-1981 Traumatic injury Patients that stayed in Port Moresby, Lae and Manding hospitals	Male = 88% Mean age = 26years (range 16-41 years)	Cervical = 22% Upper thoracic = 11% Thoraco-lumbar = 28% Lumbar = 39%	Sports: 6% (n=2)

Sports-Africa					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Hermanus et al 2010 N=183	South Africa	1980-2007 Data from an inventory of rugby-related SCIs that occurred in South Africa	All Male Mean age= 21 years Weight range= 70-79 kg Median height= 179cm	C4/C5- 38% C5/C6- 31%	Rugby specific: n=183
Vlok et al. 2010 N=46	South Africa	All patients admitted to ASCI unit at Groote Schur Hospital from April 19, 2003 – Feb 8, 2009 with diving-related injuries	91% male mean age: 23 years old	Neurological status: 25 incomplete, 13 complete, 8 had no neurological fallout C4 & C5 most common	Shallow Water Diving: Sea (20) Swimming pools (13) Rivers (7) Tidal pools (4) Location unknown (2)
Obalum et al. 2009 N=468	Lagos, Nigeria	1992-2006 Registrars at the emergency room and wards from the Lagos University Teaching Hospital (receives the majority of SCI patients in Lagos)	Males= 70.1% 66.2% were ages 40 years and below. Peak age incidence = 21-30 years.	ASIA A n=230 ASIA B n=45 ASIA C n=36 ASIA D n=41 ASIA E n= 34 Death n=82 Lumbar n=278 Cervical n=142 Thoracic n=48	Sports: 1.7% (n=8)
Noakes et al. 1999 N=67	Western Cape, South Africa	1990-1997 All rugby related SCI at the SC Unit at Conradie Hospital.	Males= 100% 54 adults 13 schoolboy rugby players	32% C4/5 42% C5/6 8% death 48% tetraplegia 35% recovery	Rugby: 100% (n=67)
Jakoet and Noakes 1998	South Africa	1995 Played in the Rugby World Cup	No information provided	Ligament/joint injuries = 34%	Rugby: 0.24% (n=1)

Sports-Africa					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
N=416 SCI=1				(Neck (including SCI) =4%) Lacerations=27% Muscle/contusions =24% Fractures/ Dislocations=11 Concussions=3	Incidence: 4.5/10,000 player hours
Kew et al. 1991 N=117	Cape Province, South Africa	1963-1989 Major SCI unit in South Africa; rugby listed as cause of SCI	Males = 100% 81 adults, 36 schoolboys. No other demographics given.	C3/C4 n=4 C4/C5 n=43 C5/C6 n=38 C6/C7 n=11 T1-18 n=6 >T8 n=1	Rugby: 100% (n=117) 21.3% scrum 17.9% ruck and maul 20.5% tackling 29.9% tackled 1.7% foul play 0.9% line out 7.7% unknown

Sports- South America					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Secin et al. 1999 N=18	Argentina	1977-1997 All rugby reported cervical injuries in Argentina. Injuries could be permanent or transient.	Mean age =22 (range 15-27) years. No other demographics given.	Complete recovery n=2 Tetraplegia n=15 Death = 1	Rugby: 100% (n=18) 61.1% scrum 16.7% tackling 11.1% tackled 11.1% maul 0.9 cases per year of rugby related SCI
da Paz et al. 1992 N=1255 (SCI=108)	Brazil	1988 36 public hospitals from 7 Brazilian capitals (represents 6.2% of all hospitals and 9.2% of the total hospital bed capacity.	Males = 80.6% Mean age=30.3 (range 6-56) years 5.6% high education	Complete = 94 (87.0%) Paraplegia = 61 (64.9%) Quadriplegia = 33 (35.1%)	Diving: 9.3% (n=10)

Table 10: Violence

Violence					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Hua et al. 2013 N=561	China	Retrospective review of individuals who were treated at The General Hospital of Chinese People's Armed Police Forces	Males = 79.9% Mean Age = 31.85 years	Stabbing Specific: Incomplete: 76.4% Cervical (23.5%) Cervical-Thor (0.0%) Thoracic (64.7%) Thor-Lumbar (11.8%) Lumbo-sacral (0.0%)	Stabbing : 3.0% Gunshot: 1.1% Blunt-force trama: 0.4%
Ibrahim et al. 2013 N=292 (traumatic and non)`	Kuala Lumpur, Malaysia	2006-2009 Admitted to the Department of Rehabilitation Medicine, Hospital Kuala Lumpur	Males = 77% Mean age = 39 years	Tetraplegia: 37% (108) Paraplegia: 63% (180)	Traumatic: Violence-induced: 4%
Wang et al. 2013 N=761	Anhui Province, China	All patients admitted to two hospitals within Anhui Province, China between January 2007 and December 2010.	Males = 77.3% Mean age = 45 years	Cervical (46.3%) Thoracic (20.4%) Lumbrosacral (33.3%)	Struck by object: 5.4% Other (Assault, Sports): 8.1%
Alshahri et al. 2012 N=307	Riyadh, Saudi Arabia	2003 to 2008 Traumatic SCI, admitted to Riyadh Military Hospital in Saudi Arabia	Males = 88% Mean age=29.5 years	Complete tetra = 21% Incomplete tetra = 31% Complete para = 29% Incomplete para = 18%	Violence - gunshot: 4.6% (n=14)
Lenehan et al. 2012 N=930	British Columbia, Canada	1995-2004 Hospital admissions to level 1 trauma center were prospectively collected using a locally designed spine database	Males = 80% Median: 35 years	Cervical: 45.1% Thoracic: 24.5% L/S: 20.9% Unspecified: 9.5%	Violence: 1.5%
Wu et al. 2012 N=143	Tianjin, China	Patients admitted to Tianjin Medical University General hospital with diagnosis of tSCI	Mean age 54.6 years Male:Female = 5:1	ASIA A = 5.6% ASIA B = 16.8% ASIA C = 18.9% ASIA D = 58.7%	Assault: 1.4% Struck by Object: 4.9%

Violence					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
DeVivo et al. 2011 N=45,442	USA	1935-2008 Persons who were treated at either a SCI Model System or a Shriners Hospital SCI unit	Males= 79.2% Mean age at injury= 32.5 years	19.8% C1-4 32.6% C 5-8 45.4% Paraplegic 2.2% Normal	Violence 11.7% (n=5,317)
Li et al. 2011 # of patients: N=1079 data collected: N=264	Beijing, China	Patients with acute TSCI admitted to civilian or military hospitals during Jan 1- Dec 31 2002	200 male (76%) Mean age: 41.7 years Range: 6-80 years	Cervical (4.9%) Thoracic (28%) Thoracolumbar, lumbar and lumbosacral (66%)	Stabbing: (0.4%) n=1 Struck by object : (18.6%) n=49
McCammon and Ethans 2011 N=553	Manitoba, Canada	1981-1985, 1998-2002, 2003-2007 Inclusion criteria: survival to hospital admission with TSCI, or outpatient referral to an SCI rehabilitation specialist. Exclusion criteria: congenital causes of paralysis such as spina bifida or cerebral palsy as well as acquired paralysis from multiple sclerosis or Guillan-Barre syndrome.	75.8% male Mean Age: 1981-1985: 29.0 years 1998-2002: 35.3 years 2003-2007: 39.8 years	1981-1985: Cervical: 46.2% Thoracic:33.0% Lumbar: 20.9% Sacral:0.0% 1998-2002: Cervical:45.0% Thoracic:33.3% Lumbar: 21.6% Sacral:0.0% 2003-2007: Cervical:51.3% Thoracic:34.9% Lumbar:12.5% Sacral:1.3%	Violence: 81-85: 4.5% 98-02: 2.1% 03-07: 3.2%
Ning et al. 2011 N=869	Tianjin, China	All patients with TSCI aged 15 or older admitted to tertiary hospitals in Tianjin from Jan 1, 2004- Dec 31, 2008	738 male (84.9%) Mean age (sd) 46.0 (14.2)	Cervical (71.5%) Thoracic (13.3%) Lumbar (15.1%) Sacral (0.1%)	Assault: (1.4%) n=12 Struck by object (?): (6.3%) n=55

Violence					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Van Den Berg et al. 2011 N=540	Aragon, Spain	Hospitalized from January 1972 to December 2008 for traumatic SCI and received medical care in Aragon following the acute stabilization period, regardless of place of injury and acute care.	79% male, mean age 39.6±17.7 yrs.	36.9% (n=199) cervical 37.4% (n=202) thoracic 19.3% (n=104) lumbar 4.3% (n=23) sacral	Violence 3.9% (n=21)
Cosar et al. 2010 N TSCI=127	Turkey	Patients with traumatic SCI who participated in an in-patient rehabilitation program at a tertiary research hospital from 1996-2008.	67.7% (n=86) male mean age 37.81±13.65 years	36 (28.3%)-tetraplegic (C4-T1) 76 (59.8%)-paraplegic (T2–T12) 15 (11.8%) had conus–cauda equina (L1–S4) injury	Violence-Gunshot Wound; 7.9% (n=10)
NSCISC 2010 N=26,852	USA	1973-2009 26 federally funded Model SCI Care Systems and National SCI Database	Male= 80.8% (1973-2009) Mean age at injury = 40.2 years (2005-2009)	2005-2009 Tetraplegia = 55.2% Paraplegia = 44.4 % Complete Tetraplegia = 16.9% Incomplete tetraplegia = 38.3% Complete Paraplegia = 22.9% Incomplete Paraplegia = 21.5%	Violence: 15.0% (n=4,028)
Pirouzmand 2010 N=12,192	Toronto, Canada	1986-2006 SCI and SI in Sunnybrook Trauma Registry Database	[SI Male=66% Median age=36 years] SCI Male= 76% Median age=33 years CSCI Median age= 30 years	[Spinal Injury= 23.2% -Cervical= 29% - Thoracic= 21% - Lumbosacral= 50%] SCI= 5.4% - Cervical=29% - Thoracic=21% - Lumbo-sacral = 50% - Multiple Levels= 20% CSCI=3%	Violence: 8.2% (n=1000)

Violence					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Qureshi et al. 2010 N=521	Rawalpindi, Pakistan	All patients who suffered a spinal injury from non-disaster causes and were admitted to the Spine Unit of a tertiary care hospital in Pakistan from 2001-2008.	402 male (77%) Mean age (sd) 39.1 (16.17)	Level of injury: Thoraco-lumbar spine (n=369, 71%), lower cervical spine (n=93, 18%), upper cervical spine (n=42, 8%) and sacrum (n=9, 2%). Injuries at multiple levels in 8 (2%)	Gunshot wound: (2%) n=11
Obalum et al. 2009 N=468	Lagos, Nigeria	1992-2006 Registrars at the emergency room and wards from the Lagos University Teaching Hospital (receives the majority of SCI patients in Lagos)	Males= 70.1% 66.2% were ages 40 years and below. Peak age incidence = 21-30 years.	ASIA A n=230 ASIA B n=45 ASIA C n=36 ASIA D n=41 ASIA E n= 34 Death n=82 Lumbar n=278 Cervical n=142 Thoracic n=48	Gunshot Wounds: 7.3% (n=34) Assault: 1.78% (n=8) Violence: 2.1% (n=10)
Ahoniemi et al. 2008 N=1647	Finland	1976-2005 Register survey; Medical records from registers of Käpylä Rehabilitation Centre	Males= 83% Mean age of injury (M/F): 1976-1985: 34.7/35.8 1986-1995: 36.7/38.3 1996-2005: 42.4/40.4	50.6% tetraplegia 49.4% paraplegia	Violence: 2.7% (n = 44)
Macciocchi et al. 2008 N= 298	South-eastern, USA	2004-2005 All patients admitted for traumatic SCI between the ages 16-59. Excluded if unable to speak English.	Males=79% Mean age =28.7±10.1 years. 74% of all eligible patients.	C1-4 ASIA A-C, n=9 C1-4 ASIA D, n=5 C5-8 ASIA A-C, n=30 C5-8 ASIA D, n=6 T1-8 ASIA A-C, n=26 T1-8 ASIA D, n=2 T9-12 ASIA A-C, n=15 T9-12ASIA D, n=3 L1-S3 ASIA A-C, n=5	Violence: 15% (n= 45)
National Spinal Cord Injury Statistical Center 2008 N=25,415	USA	1973-2008 Residents of the US who have sustained traumatic SCI. Data from Model SCI Care Systems captures approx 13% of all new SCI cases in the U.S.	Males=77.8% (2000-2008) Average age = 39.5 years (2005-2008)	2000-2008 Incomplete tetraplegia: 34.1% Complete paraplegia: 23.0% Complete tetraplegia:18.3% Incomplete paraplegia: 18.5%	Violence 15.3% (n = 3888)

Violence					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Fassett et al. 2007 N=412	Philadelphia, Pennsyl-vania, USA	1978-2005 Treated in Delaware Valley Regional Spinal Cord Injury Center at Thomas Jefferson University Hospital	≥70 years old	ASIA A ~ 45% ASIA B ~ 13% ASIA C ~ 15% ASIA D ~ 24%	Gunshot wounds: ~1% (n=4)
Shrestha et al. 2007 N=149	Eastern region, Nepal	2001-2004 Admission to hospital in Dharan with cervical spinal injury.	Males=80% Mean age=40 (6-88) years Mortality=6 (4%)	Frankel levels: A=54 (36%) B=20 (13%) C=22 (15%) D=19 (13%) E=34 (23%)	Violence: 3.4% (n = 5)
Olasode et al. 2006 N=71	Ile-Ife, Nigeria	All traumatic SCI within an 18 month period were included. Only patients with significant craniocerebral injuries were excluded.	Males=66.7% Age range=12-80 years	Tetraplegic n=39 Paraplegic n=13 Recovered with no residual disability n=14 died n=5	Violence: 4.2% (n=3)
Pickett et al 2006 N=151	London, Ontario, Canada	1997-2006 Admissions to hospital in London, Ontario with SCI	Men=74.2% Mean age = 42.2 ± 20.9 (9-96) years Mortality=12 (8%)	Cervical=75% Thoracic= 10% Lumbar=9% Junctional=6% Complete=35% Incomplete=65%	Violence: 4.6 % (n = 7)
Calancie et al. 2005 N=229	Dade County, Florida, USA	Acute traumatic spine and/or spinal cord injury admitted to Jackson Memorial Hospital	Male = 74.6% Average age at injury=40.0±17.5 years 15 were children	ASIA A = 32.8% (75) ASIA B = 4.8% (11) ASIA C = 24.0% (55) ASIA D = 31.5% (72) ASIA E = 7.0% (7.4) Complete = 32.8%	Gunshot wounds: 10.5% (n=24)
Dahlberg et al. 2005 N=152	Helsinki, Finland	January 1, 1999 cross-section date 18 years or older; of Helsinki who had permanent sensory or motor deficits because of traumatic SCI (ASIA A–D). ASIA-E cases were excluded.	Males= 76% Average age of injury=47.9 years	Data only for 121 subjects: 46% (n=56) tetraplegia 54% (n=65) paraplegia 57% (n=69) incomplete 43% (n=52) complete	Violence: 4% (n=6)

Violence					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Gur et al. 2005 N=539	South-eastern Anatolia, Turkey	1990-1999 4 hospitals that were major referral centers for trauma	Males = 77.2% Average age of injury=30.62 (1-70) years Civil servants: 22.6% (n=120) Housewives: 20.2% (n=109) Soldiers: 15.0% (n=79)	Incomplete paraplegia 29.3% (n=158) Complete paraplegia 45.1% (n=243) Incomplete tetraplegia 13.7% (n=74) Complete tetraplegia 13.9% (n=75) Cervical: 25.4% (n=137) Thoracic: 36.7% (n=198) Lumbar: 34.0% (n=183)	Gunshot wounds: 21.3% (n=115)
National Spinal Cord Injury Statistical Center 2005 N=23,683	USA	2000-2005 National Spinal Cord Injury Database from 25 Model SCI Care Systems	Males=79.6% Average age of injury=37.6 years Caucasian62.9% African American 22% Hispanic12.6%	Incomplete tetraplegia (34.5%) Complete tetraplegia (18.4%) Incomplete paraplegia (17.5%) Complete paraplegia (23.1%)	Violence: 13.8% (n=3268)
Umaru and Ahidjo 2005 N=36	Maiduguri, Nigeria	1998-2002 Admissions to hospital in Maiduguri with SCI. Exclusion Criteria: Cases with inadequate information	Males=83% Mean age=34.3±3 (13-55) years Mortality=3 (8%)	Cervical=14 (39%) Thoracic=10 (28%) Thoracolumbar=10 (28%) Lumbar=2 (6%) Complete=20 (56%) Incomplete=16 (44%)	Violence: 16.6% (n = 6)
Dryden et al. 2003 N=450	Alberta, Canada	1997-2000 Data from the Alberta Ministry of Health and Wellness, records from the Alberta Trauma Registry, and death certificates from the Office of the Medical Examiner	Male= 71.6% Median age of injury=35.0 years	61.5% (n=277) cervical 17.3% (n=78) thoracic 17.1% (n=77) lumbar/sacral/cauda equina 4.0% (n=18) unspecified	Violence: 2.4% (n=11)
Kuptnirat-saikul, 2003 N=83	Thailand	1997-2000 All SCI patients admitted to Spinal Unit, Siriraj Hospital, Nagkok.	Males=79.5% Average age =32.3 ±11.7 years.	Violence: Tetraplegic n=0 Paraplegic n=4 ASIA D=3	Violence: 8.4% (n = 7)

Violence					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Pagliacci et al. 2003 N=684	Italy	1997-1999 Rehabilitation admissions to 32 institutions in Italy with traumatic SCI.	Males= 80% Mean age=38.5 (11-94) years.	ASIA Scores: A=346 (50%) B=72 (10%) C=149 (22%) D=94 (14%) E=12 (2%)	Violence: 1.9% (n=13)
Pickett et al. 2003 N=2385	Ontario, Canada	1994-1999 SCI in Ontario Trauma Registry	Males=73% <20 years =6 (11%) 20-39 years= 29 (56%) 40-59 years=13 (25%) ≥60 years=4 (8%)	No details	Violence: 2.2% (n=52)
Burke et al. 2001 N=161	Kentucky and Indiana counties, USA	1993-1998 University of Louisville Hospital SCI Trauma Registry and patient medical records	Male= 75% Mean age of injury=28.8 years White 65% African American 35%	48% thoracic 43% complete (all cases) 58% Frankel A 17% Frankel B 7% Frankel C 15% Frankel D	Gunshot wounds: 13.0% (n=21)
Karacan et al. 2000 N=581	Turkey	1992 Nation-wide survey of SCI admissions to medical institutions. Exclusion Criteria: Patients who died before hospitalization.	Males=71% Mean age=35.5±15.1 years.	Cervical=31.7% Thoracic=26.6% Lumbar=25.1% Tetraplegia=87 (32%) Paraplegia=394 (68%)	Gunshot Wounds: 1.9% (n=11) Knife Wounds: 3.3% (n=19) Violence: 5.2% (n=30)
National Spinal Cord Injury Statistical Center 2000 N=19648	USA	1973 -1990's 24 federally funded Model SCI Care Systems and National SCI Database	Male= 81.7% 55% within 16-30 years old, mean age at injury is 31.8 years	Tetraplegia = 51.7% Paraplegia = 46.7 % Complete Tetraplegia = 18.5% Incomplete tetraplegia = 29.5% Complete Paraplegia = 27.9% Incomplete Paraplegia = 21.3%	Gunshot Wounds: 25.9% (n = 5089)
Igun et al. 1999 N=68	Plateau State, Nigeria	1984-1997 Radiologically confirmed diagnosis of spinal cord injury.	Males= 91.2% Mean age = 30 years.	Cervico-thoracic n=32 Cervico-thoracic n=36 Deaths n=18	Violence: 2.9% (n=2)

Violence					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Nobunaga et al. 1999 N=25,054	USA	1973-1998 Admissions to a Model Spinal Cord Injury Care System within 365 days of injury.	Males=81.5% Mean age=32.3±15.8 years.	Complete tetraplegia=17.4% Incomplete tetraplegia=13.8% Complete paraplegia=42.2% Incomplete tetraplegia=26.4%	Violence: 18.9% (n=4735)
Caldana and Lucca 1998 N=127	Veneto, Italy	1994-1995 New cases of traumatic spinal cord injury and non-traumatic spinal cord disease treated in regional hospitals (small hospitals excluded)	Male = 83.5%; average age of 39.8 years Female = 16.5%; average age of36 years	Cervical=62 (21 were complete) Thoracic=29(25) Thoracolumbar (T12-L1)=18(11) Caudal=14(3) Unidentified=1	Gunshot wounds: 1% (n = 6)
Farmer et al. 1998 N=1817	USA	1979-1993 Regional Spinal Cord Injury Center of Delaware Valley (RSCICDV)	Male= 91.6% Mean age=26.3 years African 74.5% American, 12.6% Hispanic, 12.6% White 17.4%	19.8% quadriplegia complete 9.4% quadriplegia incomplete 46.1 % paraplegia complete 24.7% paraplegia incomplete	Gunshot wounds: 16.9% (n=307)
Levy et al. 1998 N=136	Zimbabwe	1988-1994 Admissions to National Rehabilitation Centre with traumatic SCI.	Males= 89% Majority were between 20 and 49 years of age.	Cervical=69 (51%) Below Cervical=67 (49%)	Violence: 15% (n=20)
Carroll 1997 N=902	Arkansas, USA	1980-1989 database from Arkansas Spinal Cord Commission (ASCC) registry	Males= 82% Mean age=32 years 75% white, 22% black	Paraplegia 52% Tetraplegia 44%	Violence: 15.3% (n = 138)
Chen et al. 1997 SCI=1,586	Taiwan	1992-1996 113 hospitals (11 medical centers, 50 regional general hospitals, 52 local general hospitals)	Males=75.0% Average age of injury=46.1 years	49.9% cervical 13.3% thoracic 34.6% lumbar 6.6% (n=105) died after treatment	Violence: 2.0% (n=31)
Exner and Meinecke 1997 N= 22,212	Germany	1976-1996 All traumatic and non-traumatic SCI	72% male.	62% paraplegic 38% tetraplegic	Violence: 1% (n=239)

Violence					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Otom et al. 1997 N=151	Jordan	1988-1993 Royal Jordanian Rehabilitation Centre (RJRC) King Hussein Medical Centre (KHMC)	Males = 85.4% Average age of injury=33 years	Cervical=31.8% (n=48) Thoraco-lumbar= 68.2% (n=103) Frankel A= 53.6% (n=81) Frankel B = 10% (n=15) Frankel C =22.5% (n=34) Frankel D= 13.9% (n=21)	Gunshot wound: 25.8% (n=39) Knife Wounds: 2% (n=3)
Karamehmetaglu, 1995 N=152	Istanbul, Turkey	1992 New patients with traumatic SCI, including pediatrics.	Males=75.7% Mean age = 33 years. 72% of patients were under 40.	Tetraplegic n=50 Paraplegic n=102	Gunshot Wounds: 5.3% (n=8) Knife Wounds: 1.3% (n=2) Violence: 7% (n=10)
Levi et al. 1995 N=353	Stockholm, Sweden	1991-1994 Survey of the regional Stockholm SCI population	Males=81% Average age of injury=31 (3-77) years	Cervical 41.6% (n=147) Thoracic 36.0% (n=127) Lumbar 14.7% (n=52) Sacral 1.4% (n=5) Complete 39.4% (n=139) Incomplete 59.5% (n=210)	Assault: 3.1% (n=11)
Silberstein and Rabinovich 1995 N=196	Novosibirsk, Russia	1989-1993 All in patients with SCI admitted to the Department of SCI. Nerve root or plexus injury was excluded.	Males=93.4% Mean age =34.7 years.	Cervical spine C1-2 n=15 C3-7 n=81 Thoracic T1-12 n=54 Lumbar L1-5 n=46	Violence: 1.6% (n=3)
Hart et al. 1994 N=616	South Africa	1988-1993 All records of SCI from the Natalspruit Spinal Rehabilitation Unit	Males=80% Males between 15-40 made up the majority of patients	Complete n=404 Incomplete n=212 Cervical spine n=155 Upper thoracic n=135 Lower thoracic n=249 Lumbar spine n=74	Gunshot Wounds: 36% (n=219) Knife Wounds: 20% (n=122)
Price et al. 1994 N=376	Oklahoma, USA	1988-1990 SCI cases in Oklahoma statewide multilevel surveillance system Exclusion Criteria: Non Oklahoma residents; patients who died at scene; injuries to nerve roots or spinal plexus.	Males=80% 15-19 years=66 (18%) 20-29 years=110 (29%) 30-59 years=145 (39%) ≥60 years =43 (11%) Mortality=30 (8%)	Complete tetraplegia=55 (15%), Incomplete tetraplegia=157 (42%) Complete paraplegia=59 (16%), Incomplete paraplegia=105 (28%)	Violence: 12.8% (n = 48)

Violence					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Thurman et al. 1994 N=223	Utah, USA	1989-1991 Utah residents with SCI in Statewide reporting system of the Utah Department of Health, Bureau of Epidemiology.	Male= 76% Median age=29 years	128 (57%) tetraplegia 95 (43%) paraplegia 62 (27%) fatal 110 (49%) Frankel A/B/C 46 (21%) Frankel D 25 (11%) returned to full neurological function	Gunshot Wounds: 5.4% (n=12)
Acton et al. 1993 N=644	Arkansas, USA	1980-1989 Arkansas residents in Arkansas State Spinal Cord Commission registry. Exclusion Criteria: Lesions caused by degenerative disease; people who died at scene.	Males=80% Mean age males=32.4 years Mean age females=35.4 years	Tetraplegia=20 Paraplegia=51	Violence: 11.1% (n = 71)
Dixon et al. 1993 N=164	New Zealand	1988 SCI cases in Health Services Statistics files.	Males=73.2% Males aged 15-29 years=46%	C1-C4=49 (30%) C5-C7=30 (18%) T1-T6=19 (12%) T7-T12-19 (12%)	Violence: 2% (n=3)
Lan et al. 1993 N=99	Hualien county, Taiwan	1986-1990 Treatment of traumatic SCI in 4 hospitals in Hualien county. Exclusion Criteria: People who died before hospitalization; nontraumatic SCI; patients with transient paralysis; non residents of Hualien.	Males=80% Mean age (males)=44 years Mean age (females)=46 years Mortality=10 (10%)	Knife Wounds: Complete tetraplegia=1 Incomplete tetraplegia=1 Complete paraplegia=1	Knife Wounds: 3.0% (n=3)
da Paz et al. 1992 N=1255 (SCI=108)	Brazil	1988 36 public hospitals from 7 Brazilian capitals (represents 6.2% of all hospitals and 9.2% of the total hospital bed capacity.	Males= 80.6% Mean age= 30.3 (range 6-56) years	94 (87.0%) complete 61 (64.9%) paraplegia 33 (35.1%) quadriplegia	Gunshot Wounds: 26.9% (n=29)

Violence					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
DeVivo et al. 1992 N=6563	USA	Admissions to Spinal Cord Injury Care Systems within 1 year of injury from: 1978-1980 n=1784	Males=82.4% Mean age=28.4 years	Frankel grade at discharge: Complete=51.8% Sensory=13.7% Motor nonfunctional=7.2% Motor functional=25.9% Recovered=1.4%	Violence: 12.8% (n = 228)
		1981-1983 n=1391	Males=82.7% Mean age=30.5 years	Frankel grade at discharge: Complete=57.2% Sensory=11.7% Motor nonfunctional=7.8% Motor functional=22.5% Recovered=0.8%	Violence: 13.6% (n = 189)
		1984-1986 n=1433	Males=84.5% Mean age=31.2 years	Frankel grade at discharge: Complete=48.6% Sensory=16.2% Motor nonfunctional=11.0% Motor functional=23.5% Recovered=0.6%	Violence: 16.2% (n = 232)
Dincer et al. 1992 N=1,694	Turkey	1974-1985 SCI patients admitted to Ankara Rehabilitation Centre	Males = 75.7% Average age of injury=26.8 (1-70) years Agricultural workers= 19.8% (n=336) Housewives= 19.9% (n=338) Private industry workers = 19.5% (n=330)	Complete paraplegia 85.1% (n=1442) Incomplete paraplegia 6.9% (n=116) Complete tetraplegia 4.8% (n=82) Incomplete tetraplegia 3.2% (n=54)	Gunshot wounds: 22.0% (n=372) Knife Wounds: 2.01% (n=34)
Goebert et al. 1991 N=59	Hawaii, USA	1987-1989 Traumatic injury Patient at the Rehabilitation Hospital of the Pacific	Male=84.7% Mean age=20.2 years 16-30 years =44.8% 31-45 years =25.9% 46-60 years= 12.1% 61-90 years =12.1%	High Quad (C1-4)=16.2% Low Quad (C5-8)=45.9% High Thoracic (T1-6)=18.9% Low Thoracic (T7-12)=10.8% Lumbar (L1-5)=8.1% Frankel Grades: Complete (A)=50.8% Motor functional (D)=35.6%	Assault: 3% (n=2) Knife Wounds: 2% (n = 1)

Violence					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Goebert et al. 1991 N=59	Hawaii, USA	1987-1989 Traumatic injury Patient at the Rehabilitation Hospital of the Pacific	Male=84.7% Mean age=20.2 years 16-30 years =44.8% 31-45 years =25.9% 46-60 years= 12.1% 61-90 years= 12.1%	(C1-4) =16.2% (C5-8)=45.9% (T1-6) =18.9% (T7-12) =10.8% (L1-5)=8.1% Frankel Grades: Complete (A)=50.8% Motor functional (D)=35.6%	Gunshot wounds: 10% (n=6)
Biering-Sorensen et al. 1990 N=268	Kingdom of Denmark (Denmark, Greenland, Faroe Islands)	January 1975-December 1984 Admission to national specialized rehabilitation hospitals	Male=76.9% 40% within 15-24 years old	Complete tetraplegia = 22% Incomplete tetraplegia = 29% Complete paraplegia = 26% Incomplete paraplegia = 23%	Violence: 2% (n=5)
Pedersen et al. 1989 N=27	Greenland	1965-1986 Admissions to rehabilitation hospital in Hornback with traumatic SCI; Patients injured in Greenland.	Males=74% Mean age=33.5 (14-50) years.	Complete tetraplegia=1 Incomplete paraplegia=2	Violence: 11.1% (n=3)
Chen et al. 1985 N=560	Taipei, Taiwan	1978-1981 All record from general hospitals in Taipei. Included all spinal cord lesion with or without vertebral injury.	86% male. Mean age = 35.9 (range 20-49) years.	Incomplete Paraplegia n=118 Complete paraplegia n=180 Incomplete Tetraplegia n=117 Complete Tetraplegia n=145 Death n=31	Violence: 2.7% (n=15)
Griffin and Opitz 1985 N=154	Olmsted County, Minnesota, USA	1935-1981 Medical records-linkage system of the Rochester Project at the Mayo Clinic, periodic multi-centre surveys	Males= 72% 153 White, 1 Black	56.5% (n=87) cervical 31.8% (n=49) thoracic 9.1% (n=14) lumbar 2.6% (n=4) sacral	Assault: 3.2% (n=5)
Gee and Sinha 1982 N=36	Papua New Guinea	1978-1981 Traumatic injury Patients that stayed in Port Moresby, Lae and Manding hospitals	Male = 88% Mean age = 26 years (range 16-41 years)	Cervical = 22% Upper thoracic = 11% Thoraco-lumbar = 28% Lumbar = 39%	Assault: 6% (n=2)

Table 11: Self-Harm

Self-Harm					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
McCammon and Ethans 2011 N=553	Manitoba, Canada	1981-1985, 1998-2002, 2003-2007 Inclusion criteria: survival to hospital admission with TSCI, or outpatient referral to an SCI rehabilitation specialist. Exclusion criteria: congenital causes of paralysis such as spina bifida or cerebral palsy as well as acquired paralysis from multiple sclerosis or Guillan-Barre syndrome.	75.8% male Mean Age: 1981-1985: 29.0 years 1998-2002: 35.3 years 2003-2007: 39.8 years	1981-1985: Cervical: 46.2% Thoracic:33.0% Lumbar: 20.9% Sacral:0.0% 1998-2002: Cervical:45.0% Thoracic:33.3% Lumbar: 21.6% Sacral:0.0% 2003-2007: Cervical:51.3% Thoracic:34.9% Lumbar:12.5% Sacral:1.3%	Self Harm: 81-85: 0.0% 98-02: 1.0% 03-07: 0.4%
Wu et al. 2011 N=41,586	Taiwan	All SCI patients older than 20 years of age and admitted to medical services from 1998-2008 that were identified using the National Health Insurance Research Database of Taiwan.	62% male (n=25857) 61.2% had traumatic SCI (n=25,439)	Cervical: 51.8% N=21,557 Thoracic: 12.3% N=5,098 Lumbar: 22.9% N=9,533 Other SCI: 13.0% N=5,398	Attempted suicide: (2.3%) n=574 calculated using N traumatic SCI= 25,439)
Stanford et al. 2007 N=2,752	Sydney, Australia	1970-2000 All SCI injuries with neurological deficits and documented evidence of self-harm in New South Wales, Australia	36 males; Median age =30 (range 15-74) years.	ASIA A n=23 ASIA B n=7 ASIA C n=4 ASIA D n=22	Self-Harm: 2.6% (n=72)
Pickett et al 2006 N=151	London, Ontario, Canada	1997-2006 Admissions to hospital in London, Ontario with SCI	Men=74.2% Mean age = 42.2 ± 20.9 (9-96) years Mortality=12 (8%)	Cervical=75% Thoracic= 10% Lumbar=9% Junctional=6% Complete=35% Incomplete=65%	Self-Harm: 1.3% (n=2)
Dahlberg et al. 2005 N=152	Helsinki, Finland	January 1, 1999 cross-section date Adult citizens (18 years or more) of Helsinki who had permanent sensory or motor deficits because of traumatic SCI (ASIA A–D).	Males = 76% Average age of injury=47.9 years	Data only for 121 subjects: 46% (n=56) tetraplegia 54% (n=65) paraplegia 57% (n=69) incomplete 43% (n=52) complete	Self-Harm: 10% (n=15)

Self-Harm					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
		ASIA-E cases were excluded.			
Gur et al. 2005 N=539	South-eastern Anatolia, Turkey	1990-1999 4 hospitals that were major referral centers for trauma	Males = 77% Average age of injury=30.62 (1-70) years Civil servants: 22.6% (n=120) Housewives: 20.2% (n=109) Soldiers: 15.0% (n=79)	Incomplete paraplegia 29.3% (n=158) Complete paraplegia 45.1% (n=243) Incomplete tetraplegia 13.7% (n=74) Complete tetraplegia 13.9% (n=75) Cervical: 25.4% (n=137) Thoracic: 36.7% (n=198) Lumbar: 34.0% (n=183)	Self-Harm: 2.8% (n=15)
Martin et al. 2005 N=563 (SCI=13)	USA	All patients from the National Trauma Data Bank (2002) with a diagnosis of hanging injury, and survival to admission.	Males=65% Mean age =30.4±13.1 years.	13 patients had SCI: 12 cervical 1 thoracic	Self-Harm: 3% (n=13)
Dryden et al. 2003 N=450	Alberta, Canada	1997-2000 Data from the Alberta Ministry of Health and Wellness, records from the Alberta Trauma Registry, and death certificates from the Office of the Medical Examiner	Males= 71.6% Median age of injury=35.0 years	61.5% (n=277) cervical 17.3% (n=78) thoracic 17.1% (n=77) lumbar/sacral/cauda equina 4.0% (n=18) unspecified	Self-Harm: 2.0% (n=9)
Pagliacci et al. 2003 N=684	Italy	1997-1999 Rehabilitation admissions to 32 institutions in Italy with traumatic SCI.	Males=80% Mean age=38.5 (11-94) years.	ASIA Scores: A=346 (50%) B=72 (10%) C=149 (22%) D=94 (14%) E=12 (2%)	Self-Harm: 4.4% (n=30)
Pickett et al. 2003 N=2385	Ontario, Canada	1994-1999 SCI in Ontario Trauma Registry	Males= 59% <20 years =2 (11%) 20-39 years= 19 (56%) 40-59 years=13 (25%) ≥60 years=4 (8%)	No details	Self-Harm: 1.4% (n=33)
Catz et al. 2002 N=250	Israel	1959-1992 Traumatic SCI, admitted to the Loewenstein Rehabilitation Center, the major referral	Males= 75.6% Mean age = 34.5 years (range 6-83 years).	High cervical 7.6% low cervical 28.8% thoracic 32.4% lumbar 31.2%	Self-Harm: 13.6% (n=34)

Self-Harm					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
		center for rehabilitation medicine in Israel.			
Exner & Meinecke 1997 N= 22,212	Germany	1976-1996 All traumatic and non-traumatic SCI	72% male.	62% paraplegic 38% tetraplegic	Self-Harm: 5% (n=1080)
Otom et al. 1997 N=151	Jordan	1988-1993 Royal Jordanian Rehabilitation Centre (RJRC) King Hussein Medical Centre (KHMC)	Males= 85.4% Average age of injury=33 years	Cervical=31.8% (n=48) Thoraco-lumbar= 68.2% (n=103) Frankel A= 53.6% (n=81) Frankel B = 10% (n=15) Frankel C =22.5% (n=34) Frankel D= 13.9% (n=21)	Self-Harm: 0.7% (n=1)
Levi et al. 1995 N=353	Stockholm, Sweden	1991-1994 Survey of the regional Stockholm SCI population	Males=81% Average age of injury=31 (3-77) years	Cervical 41.6% (n=147) Thoracic 36.0% (n=127) Lumbar 14.7% (n=52) Sacral 1.4% (n=5) Complete 39.4% (n=139) Incomplete 59.5% (n=210)	Self-Harm: 4.0% (n=14)
Shingu et al. 1995 N=9752	Japan	1990-1992 Survey of nationwide institutions assumed to accept SCI patients. Exclusion criteria: Patients only receiving outpatient services in this period	Males= 80.4% Mean age=48.6±19.1 (0.92-96) years.	Frankel levels: A=2518 (25.8%) B=1208 (12.4%) C=1984 (20.3%) D=1761 (18.1%) E=2242 (23.0%) Unknown=39 (0.4%) Cervical=7317 (75.0%) Below cervical=2408 (24.7%) Unknown=27 (0.3%) Complete=61.1%	Self-Harm: 1.7% (n=166)
Silberstein & Rabinovich 1995 N=196	Novosibirsk, Russia	1989-1993 All in patients with SCI admitted to the Department of SCI. Nerve root or plexus injury was excluded.	183 males. Mean age =34.7 years.	Cervical spine C1-2 n=15 C3-7 n=81 Thoracic T1-12 n=54 Lumbar L1-5 n=46	Self-Harm: 3.1% (n=6)
Shingu et al. 1994 N=3465	Japan	1990 Survey of nationwide institutions assumed to accept SCI patients; Exclusion criteria: Traumatic cervical syndrome cases and extradural nerve root; Patients only receiving outpatient	Males (overall) = 81.2% Mean age (self-harm) =31.3 years	Cervical=14 (23%) Below cervical=46 (77%)	Self-Harm: 1.7% (n=59)

Self-Harm					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
		services in this year or who obtained injury abroad			
Lan et al. 1993 N=99	Hualien, Taiwan	1986-1990 Treatment of traumatic SCI in 4 hospitals in Hualien county. Exclusion Criteria: People who died before hospitalization; nontraumatic SCI; patients with transient paralysis; non residents of Hualien.	Males=80%) Mean age (males)=44 years Mean age (females)=46 years Mortality=10 (10%)	Complete paraplegia=1 Incomplete paraplegia=1	Self-Harm: 2.0% (n=2)
Biering-Sorensen et al. 1990 N=268	Kingdom of Denmark (Denmark, Greenland, Faroe Islands)	January 1975-December 1984 Admission to national specialized rehabilitation hospitals	Male=76.9% 40% within 15-24 years old	268 traumatic lesions Cervical = 136 Thoracic = 76 Lumbar = 56 Complete tetraplegia = 22% Incomplete tetraplegia = 29% Complete paraplegia = 26% Incomplete paraplegia = 23%	Self-Harm: 8% (n=21)
Pedersen et al. 1989 N=27	Greenland	1965-1986 Admissions to rehabilitation hospital in Hornback with traumatic SCI; Patients injured in Greenland.	Males=74% Mean age=33.5 (14-50) years.	Complete paraplegia=5 Incomplete paraplegia=2	Self-Harm: 25.9% (n=7)
Chen et al. 1985 N=560	Taipei, Taiwan	1978-1981 All record from general hospitals in Taipei. Included all spinal cord lesion with or without vertebral injury.	Males= 86% Mean age = 35.9 (range 20-49) years.	Incomplete Paraplegia n=118 Complete paraplegia n=180 Incomplete Tetraplegia n=117 Complete Tetraplegia n=145 Death n=31	Self-Harm: 1.4% (n=8)

Table 12: Work-Related Incidents

Work-Related Incidents					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Wu et al. 2012 N=143	Tianjin, China	Patients admitted to Tianjin Medical University General hospital with diagnosis of tSCI	Mean age 54.6 years Male:Female = 5:1	ASIA A = 5.6% ASIA B = 16.8% ASIA C = 18.9% ASIA D = 58.7%	Work Related: 2.1%
Correa et al. 2011 N=173	Chile	1986-2005 Patients with traumatic SCI incurred in the workplace admitted to Hospital del Trabajador in Santiago, Santiago, Chile.	99.4% (172) male Age at TSCI onset was 38.2±12.1 years.	78 (45.1%) - complete paraplegia 54 (31.2%) - incomplete paraplegia 18 (10.4%) -complete tetraplegia 23 (13.3%) - incomplete tetraplegia.	Work-related incidents: Falls from a height-49.7% (86 cases) Trauma blows to the vertebral spine – 35.3% (61 cases) Traffic accident – 8.7% (15 cases) Other causes – 6.4% (11 cases)
McCammon and Ethans 2011 N=553	Manitoba, Canada	1981-1985, 1998-2002, 2003-2007 Inclusion criteria: survival to hospital admission with TSCI, or outpatient referral to an SCI rehabilitation specialist. Exclusion criteria: congenital causes of paralysis such as spina bifida or cerebral palsy as well as acquired paralysis from multiple sclerosis or Guillan-Barre syndrome.	75.8% male Mean Age: 1981-1985: 29.0 years 1998-2002: 35.3 years 2003-2007: 39.8 years	1981-1985: Cervical: 46.2% Thoracic:33.0% Lumbar: 20.9% Sacral:0.0% 1998-2002: Cervical:45.0% Thoracic:33.3% Lumbar: 21.6% Sacral:0.0% 2003-2007: Cervical:51.3% Thoracic:34.9% Lumbar:12.5% Sacral:1.3%	Work: 81-85: 3.6% 98-02: 2.6% 03-07: 4.0%
Ning et al. 2011 N=869	Tianjin, China	All patients with TSCI aged 15 or older admitted to tertiary hospitals in Tianjin from Jan 1, 2004- Dec 31, 2008	738 male (84.9%) Mean age (sd) 46.0 (14.2)	Cervical (71.5%) Thoracic (13.3%) Lumbar (15.1%) Sacral (0.1%)	Work-related incident: 0.8% (n=7)
Pickett et al 2006 N=151	London, Ontario, Canada	1997-2006 Admissions to hospital in London, Ontario with SCI	Men=74.2% Mean age = 42.2 ± 20.9 (9-96) years Mortality=12 (8%)	Cervical=75% Thoracic= 10% Lumbar=9% Junctional=6% Complete=35% Incomplete=65%	Work-related: 6.6% (n=10)

Work-Related Incidents					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Krassioukov et al. 2003 N=58	Toronto, Canada	1998-2000 Admissions to hospital in Toronto with traumatic SCI. Exclusion Criteria: Patients admitted with ASIA E.	Males=87% Ages 17-59 years: Mean age=38.7 (17-56) years	ASIA A and B=30% ASIA C and D=70%	Work-related 10.3% (n=6)
Singh et al. 2003 N=483	Haryana, India	2000-2001 Accident and emergency services and department of Orthopaedic Surgery and Rehabilitation of Pt. B.D. Sharma PGIMS, Rohtak.	Males = 74.7%) Mean age at injury=35.4 years	164 tetraplegia 283 paraplegia	Mine cave-in: 6.42% (n=31)
Catz et al. 2002 N=250	Israel	1959-1992 Traumatic SCI, admitted to the Loewenstein Rehabilitation Center, the major referral center for rehabilitation medicine in Israel.	Males=75.6% Mean age = 34.5 years (range 6-83 years).	High cervical 7.6% low cervical 28.8% thoracic 32.4% lumbar 31.2%	Work-related: 26.8% (n=34)
O'Connor 2001 N=369	Australia	1986-1997 Australian Spinal Cord Injury Register	Males= 95% 75% aged 25-54 years 28% labourers (construction, mining)	Data for 358 subjects: 35% incomplete paraplegia 34% complete paraplegia 21% incomplete tetraplegia 10% complete tetraplegia 34.4% (n=123) cervical 45.5% (n=163) thoracic 23.2% (n=83) lumbar	Work-related: 13% (n=369)
van Asbeck et al. 2000 N=126 (specific data for 113)	Netherlands	1994 Patients with SCI in National Registration system with medical records. Exclusion Criteria: Spinal contusions with no or temporary neurological symptoms.	Males=77% <20 years=15 (13%) 21-30 years=28 (25%) 31-60 years=36 (32%) >61=34 (30%) Mortality=18 (16%)	Complete tetraplegia=26 (23%) Incomplete tetraplegia=39 (34%) Complete paraplegia=29 (26%) Incomplete paraplegia=19 (17%)	Work-related: 4.4% (n=5)
Igun et al. 1999 N=68	Plateau State, Nigeria	1984-1997 Radiologically confirmed diagnosis of spinal cord injury.	Males = 91.2% Mean age = 30 years.	Cervico-thoracic n=32 Cervico-thoracic n=36 Deaths n=18	Mining cave-in 17.96% (n=12)

Work-Related Incidents					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Caldana and Lucca 1998 N=127	Veneto, Italy	1994-1995 New cases of traumatic spinal cord injury and non-traumatic spinal cord disease treated in regional hospitals (small hospitals excluded)	Male = 83.5%; Average age (male) of 39.8 years Average age (female) of 36 years	Cervical=62 (21 were complete) Thoracic=29(25) Thoracolumbar (T12-L1)=18(11) Caudal=14(3) Unidentified=1	Work-related: 22% (n=28)
Exner and Meinecke 1997 N= 22,212	Germany	1976-1996 All traumatic and non-traumatic SCI	72% male.	62% paraplegic 38% tetraplegic	Work-related: 14% (n=3119)
Stavrev et al. 1994 N=980	Plovdiv and Plovdiv region, Bulgaria	1983-1992 Treatment for SCI at 2 clinics in Plovdiv region	Males=72% 21-40 years =387 (40%) 41-60 years =298 (30%) 61-70 years =137 (14%) >70 years =76 (8%) Mortality=72 (7%)	Cervical=206 (21%) Thoracic (>T7) =275 (28%) Lumbar=399, (41%) Other=100 (10%) Neurological deficit=409 (42%) No neurological deficit=572 (58%)	Work-related: 7.2% (n=71)
Dixon et al. 1993 N=164	New Zealand	1988 SCI cases in Health Services Statistics files.	Males=73.2% Males aged 15-29 years=46%	C1-C4=49 (30%) C5-C7=30 (18%) T1-T6=19 (12%) T7-T12-19 (12%)	Work-related: 3% (n=5)
Tator et al. 1993 N=201	Toronto, Canada	1974-1981 First 220 admissions to Acute Spinal Cord Injury Unit in Toronto. Exclusion Criteria: Admissions >30 days after injury; injuries without cord involvement; nerve root involvement only; penetrating injuries; injuries below L2; Patients who died on scene or upon arrival.	Males=79.6% Mean age=34.5 years Median age=27.0 years	Cervical=63.2%, Thoracic=16.9%, Thoraco-lumbar=19.9% Complete=46.2%, Incomplete=53.8%	Work-related: 13.9% (n=28)

Work-Related Incidents					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Ring et al. 1986 N=202	New South Wales, Australia	1977-1978 Admissions to New South Wales hospitals with spinal injury; death certificates that involved spinal injury. 99% of cases had neurological involvement.	Males=81% 15-24 years = 84 (42%) 25-44 years =58 (29%) 45-64 years =30 (15%) ≥65 years=15 (7%) Mortality=69 (39%)	Glasgow Outcome Scale: Severe disability=98(49%) Moderate disability=19(9%) Good recovery=13(6%) Not recorded=3(1%)	Work-related: 9.4% (n=19)

Table 13: Natural Disasters

Natural Disasters					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Burns et al. 2010 N=19 (SCI) Estimated Deaths= 250,000-300,000 Estimated Injuries= 300,000 Estimated SCI survivors= 150	Haiti	Patients with SCI at the Haiti Hospital Appeal as a result of the earthquake (magnitude 7.0) on January 12, 2010 in Haiti	Not Provided	Cervical= 1 (5.2%) (C6 motor complete) Asia A or B =13 (68.4%) - Majority low thoracic or lumbar spine injuries - High thoracic injuries uncommon	Earthquake 12.7% (n=19)
Karamouzian et al. 2010 N= 130 (SCI) Estimated Injured= 30,000	Bam, Iran	2005-2006 Registered participants at the Kerman Welfare Organization	Surveyed sample (remaining n=103) Male= 40.8% Female= 59.2% Mean age= 31.5±10.2 years	Cervical= 2 (1.9%) Thoracic= 8 (7.8%) Thoracolumbar= 93 (90.3%)	Earthquake: 0.43% (n=130)
Chen et al. 2009 N=78 Estimated injured= >300,000	Sichuan, China	Treatment for spinal injuries in Chengdu hospital following May 12, 2008 earthquake (magnitude 8.0).	Males=51% Mean age=42(7-84) years Women=38 (49%) No Mortality	Cervical=13 (11%) Thoracic=48 (40%) Lumbar=58 (49%) Single level injuries=55 (71%) Multiple level injuries=23 (29%) Neurological disability=53.8%	Earthquake: 0.03% (n=78)
Dong et al. 2009 N=198(SCI) Estimated injuries 374,643	Sichuan, China	Patients admitted to hospital in Sichuan region with spinal injuries from earthquake (magnitude 8.0) on May 12 2008. Exclusion Criteria: Patients injured by earthquake-related MVCs.	Not provided	Lumbar injuries = 55.3% Thoracic injuries = 31.1% Neurologic deficit in 65 patients: Frankel Levels: A=14 (7%) B=8 (4%) C=24 (12%) D=19 (10%)	Earthquake: 0.05% (n=198)
Raissi et al. 2007 N=54 Estimated injured= 23,000	Bam, Iran	SCI patients listed with Social Welfare Organization in Bam area and were injured in the December 6, 2003 earthquake (magnitude 6.8) in Bam, Iran	Patients surveyed n=54 Male=46% Mean age=31.9±9.6 years	General injury level*: Between T10 and T12=37 L2 and below=14 Incomplete=3 *(complete neurological level exam not possible) Pain syndromes=52 (96%)	Earthquake: 0.23% (n=54)

Natural Disasters					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Rathore et al. 2007 N=187 Estimated injured= 126,000	Northern Pakistan	Patients with SCI from the earthquake (magnitude7.6) on October 8, 2005 in Rawalpindi.	Surveyed sample (n=187) Males=43% Mean age=28.3±12.4 years	Complete paraplegia= 43% (n=81) Incomplete paraplegia= 46% (n=86) Incomplete tetraplegia= 5% (n=9) No neurological deficit= 6% (n=11)	Earthquake: 0.15% (n=187)
Tauqir et al. 2006 N=194 Estimated injured= 100,000	Northern Pakistan	Admission to 4 hospitals in Rawalpindi and Islamabad with SCI due to earthquake on October 8, 2005 (magnitude7.6).	Surveyed Sample (n=122) Males=26% 16-39 years =77% (n=151)	Cervical=5 (3%) Thoracic=48 (25%) Lumbar=120 (62%) Thoracolumbar=18 (9%) Cervicothoracic=1 Lumbrosacral=1 Cord contusion=1	Earthquake: 0.19% (n=194)
Tahmasebi et al. 2005 N=210 N=6 (SCI) Estimated injured= 30,000	Bam, Iran	Patients admitted to hospitals in Tehran with musculoskeletal injuries following earthquake on December 26, 2003 (magnitude 6.8).	Surveyed sample (n=210) Male=42.4% Mean age=30.2 (7-70) years.	Not provided	Earthquake: 0.02% (n=6)
Chang et al. 2000 N=5000 Estimated injuries= 420,000	Tangshan, China	Individuals who sustained SCIs in the Tangshan earthquake (magnitude 7.8) on July 28, 1976.	Sampled surveyed (n=105) Males= 31.4% Average age=46 (38-62) years.	T12/L1= 86.5% (n=64)	Earthquake: 1.2% (n=5000)
Tanaka et al. 1999 N= 29 (SCI) Estimated Injured= 41,000	Hanshin region, Japan	Survey of 53% of all hospital beds in Hanshin area in first 15 days following the January 17, 1995 earthquake (magnitude 7.2). Exclusion criteria: Patients who were dead upon arrival to hospital.	Patients surveyed n=6107 Males=44% Total mortality=527 (9%) Mortality among SCI=1 (3%)	Spinal cord injuries=29 Spinal fractures (n=414): Cervical=18 (4%) Thoracic=145 (35%) Lumbar=251 (61%)	Earthquake: 0.07% (n=29)
Maruo and Matumoto 1996 N=6 (SCI) Estimated injured= 34,900	Hanshin region, Japan	Interviews of patients suffering from spinal or truck injuries following the January 17, 1995 Hanshin earthquake (magnitude 7.2).	Patients surveyed n=230 Males=29.6% Average age=62.9%	Frankel levels (n=6) A=3 D=3 Most common levels of vertebral fracture (n=140) T12=49 (29%) L1=49 (29%) L2=25 (15%) L3=11 (6.5%)	Earthquake: 0.02% (n=6)

Natural Disasters					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Burke et al. 1993 N=42 (SCI) Estimated injured= 150,000	Yerevan, Armenia	Patients admitted to newly established SCI unit following Armenian earthquake on December 7, 1988.	No information given.	All patients with paraplegia. Minor paralysis=35.7% (n=15) Severe paralysis=64.3% (n=27) Confined to a wheelchair=16.3% (n=7) Mortality=5% (n=2)	Earth-quake: 0.03% (n=42)

Table 14: Other

Other					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Middleton et al. 2012 N=324	New South Wales, Australia	January 2004 to June 2008, Data from Ambulance Service of New South Wales	Males = 85% Mean age = 42 years	Not Specified	Other: 8.3%
Wu et al. 2012 N=143	Tianjin, China	Patients admitted to Tianjin Medical University General hospital with diagnosis of tSCI	Mean age 54.6 years Male:Female = 5:1	ASIA A = 5.6% ASIA B = 16.8% ASIA C = 18.9% ASIA D = 58.7%	Other: 1.4%
Alcanyis-Alberola et al. 2011 N=250	Valencia, Spain	Iatrogenic SCI (SCI preced by any diagnostic, surgical, pharmacological or physical therapy procedure carried out by healthcare professionals or prescribed by a physician Exclusion: patients who underwent surgery due to tumors	Mean age=56.2 years	Cervical=31% Thoracic=25% Lumbar=41% Sacrum=3%	Iatrogenic SCI = 10.4% of total
DeVivo et al. 2011 N=45,442	USA	1935-2008 Persons who were treated at either a SCI Model System or a Shriners Hospital SCI unit	N = 45,442 Males= 79.2% Mean age at injury= 32.5 years	19.8% C1-4 32.6% C 5-8 45.4% Paraplegic 2.2% Normal	Other: 8.0% (n=3,635)
Li et al. 2011 # of patients: N=1079 data collected: N=264	Beijing, China	Patients with acute TSCI admitted to civilian or military hospitals during Jan 1- Dec 31 2002	200 male (76%) Mean age: 41.7 years Range: 6-80 years	Cervical (4.9%) Thoracic (28%) Thoracolumbar, lumbar and lumbosacral (66%)	Other: (16.3%) n=43
McCammon and Ethans 2011 N=553	Manitoba, Canada	1981-1985, 1998-2002, 2003-2007 Inclusion criteria: survival to hospital admission with TSCI, or outpatient referral to an SCI rehabilitation specialist. Exclusion criteria: congenital causes	75.8% male Mean Age: 1981-1985: 29.0 years 1998-2002: 35.3 years 2003-2007: 39.8 years	1981-1985: Cervical: 46.2% Thoracic:33.0% Lumbar: 20.9% Sacral:0.0% 1998-2002: Cervical:45.0% Thoracic:33.3% Lumbar: 21.6% Sacral:0.0%	Other: 81-85: 3.6% 98-02: 0.0% 03-07: 1.2%

Other					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
		of paralysis such as spina bifida or cerebral palsy as well as acquired paralysis from multiple sclerosis or Guillan-Barre syndrome.		2003-2007: Cervical:51.3% Thoracic:34.9% Lumbar:12.5% Sacral:1.3%	
Ning et al. 2011 N=869	Tianjin, China	All patients with TSCI aged 15 or older admitted to tertiary hospitals in Tianjin from Jan 1, 2004- Dec 31, 2008	738 male (84.9%) Mean age (sd) 46.0 (14.2)	Cervical (71.5%) Thoracic (13.3%) Lumbar (15.1%) Sacral (0.1%)	Other: (0.2%) n=2
Wu et al. 2011 N=41,586	Taiwan	All SCI patients older than 20 years of age and admitted to medical services from 1998-2008 that were identified using the National Health Insurance Research Database of Taiwan.	62% male (n=25857) 61.2% had traumatic SCI (n=25,439)	Cervical: 51.8% N=21,557 Thoracic: 12.3% N=5,098 Lumbar: 22.9% N=9,533 Other SCI: 13.0% N=5,398	Other: 10.4% n=2646 calculated using N traumatic SCI= 25,439)
Couris et al. 2010 N=936	Ontario, Canada	The study included all patients aged 18 years or older living in Ontario during the fiscal years 2003–2004 (through 2006–2007) who experienced TSCI.	74.1% (n=694) male mean age: 51.3±20.1 years	65.5% (n=610) cervical 21.3% (n=198) thoracic 10.0% (n=93) lumbar 3.2% (n=30) other	Other: 13.5% (n=126)
Hagen et al. 2010 N=336	Norway (2 counties: Hordaland and Sogn og Fjordane)	Patients who suffered a TSCI from 1952-2001 and lived in Hordaland or Sogn og Fjordane	Male to female ratio was 4:7:1 % of women varied from 6.9-24.4%	Complete (41.4%) Incomplete (58.6%) Cervical (52.4%) Thoracic (29.5%) Lumbar/sacral (18.2%)	Other: 10.3% (n=34)
NSCISC 2010 N=26,852	USA	1973-2009 26 federally funded Model SCI Care Systems and National SCI Database	Male= 80.8% (1973-2009) Mean age at injury = 40.2 years (2005-2009)	2005-2009 Tetraplegia = 55.2% Paraplegia = 44.4 % Complete Tetraplegia = 16.9%	Other: 8.5% (n=2,282)

Other					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
				Incomplete tetraplegia = 38.3% Complete Paraplegia = 22.9% Incomplete Paraplegia = 21.5%	
Pirouzmand 2010 N=12,192	Toronto, Canada	1986-2006 SCI and SI in Sunnybrook Trauma Registry Database	[SI Male=66% Median age=36 years] SCI Male= 76% Median age=33 years CSCI Median age= 30 years	[Spinal Injury= 23.2% -Cervical= 29% - Thoracic= 21% - Lumbosacral= 50%] SCI= 5.4% - Cervical=29% - Thoracic=21% - Lumbo-sacral = 50% - Multiple Levels= 20% CSCI=3%	Other: 4.1% (n=500)
Qureshi et al. 2010 N=521	Rawalpindi, Pakistan	All patients who suffered a spinal injury from non-disaster causes and were admitted to the Spine Unit of a tertiary care hospital in Pakistan from 2001-2008.	402 male (77%) Mean age (sd) 39.1 (16.17)	Level of injury: Thoraco-lumbar spine (n=369, 71%), lower cervical spine (n=93, 18%), upper cervical spine (n=42, 8%) and sacrum (n=9, 2%). Injuries at multiple levels in 8 (2%) Complete SCI-(43%) Incomplete SCI-(33%)	Hit by falling object: 4% (n=21)
Chabok et al. 2009 N=245	Guilan, Iran	Patients admitted to Poursina Hospital, with TSCI	71.8% male	Neurological status: 15 complete 29 incomplete 201 no neurological damage cervical- n=17 thoracic- n=6 thoracolumbar- n=48 Lumbar= 12	Other: 2.4% (n=6)
Obalum et al. 2009 N=468	Lagos, Nigeria	1992-2006 Registrars at the emergency room and wards from the Lagos University Teaching Hospital	70.1% male, 66.2% were ages 40 years and below. Peak age incidence = 21-30 years.	ASIA A n=230 ASIA B n=45 ASIA C n=36 ASIA D n=41 ASIA E n= 34 Death n=82	Other: 0.4% (n=2)

Other					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
		(receives the majority of SCI patients in Lagos)		Lumbar n=278 Cervical n=142 Thoracic n=48	
Ahoniemi et al. 2008 N=1647	Finland	1976-2005 Register survey; Medical records from registers of Käpylä Rehabilitation Centre	Males = 83% Mean age of injury (M/F): 1976-1985: 34.7/35.8 1986-1995: 36.7/38.3 1996-2005: 42.4/40.4	50.6% tetraplegia 49.4% paraplegia	Other: 10.0% (n=165)
National Spinal Cord Injury Statistical Center 2008 N=25,415	USA	26 federally funded Model SCI Care Systems and National SCI Database	Males=77.8% Average age = 39.5 years	Incomplete tetraplegia: 34.1% Complete paraplegia: 23.0% Complete tetraplegia:18.3% Incomplete paraplegia: 18.5%	Other: 8.1% (n=2059)
Fassett et al. 2007 N=412	Philadelphia, Pennsyl-vania, USA	1978-2005 Treated in Delaware Valley Regional Spinal Cord Injury Center at Thomas Jefferson University Hospital	≥70 years old	High quadriplegic (C4 and above)=42% Paraplegic=22% ASIA A ~ 45% ASIA B ~ 13% ASIA C ~ 15% ASIA D ~ 24%	Other: 11% (n=45)
Shrestha et al. 2007 N=149	Eastern region, Nepal	2001-2004 Admission to hospital in Dharan with cervical spinal injury.	Males=80% Mean age=40 (6-88) years Mortality=6 (4%)	Frankel levels: A=54 (36%) B=20 (13%) C=22 (15%) D=19 (13%) E=34 (23%)	Struck by object: 9.4% (n=14) Animal related: 3.4% (n=5)
Olasode et al. 2006 N=71	Ile-Ife, Nigeria, Africa	All traumatic SCI within an 18 month period were included. Only patients with significant craniocerebral injuries were excluded.	Males=66.7% Age range=12-80 years	Tetraplegic n=39 Paraplegic n=13 Recovered with no residual disability n=14 Died n=5	Other: 7.0% (n=5)
Calancie et al. 2005 N=229	Dade County, Florida, USA	Acute traumatic spine and/or spinal cord injury admitted to Jackson Memorial Hospital	Male = 74.6% Average age at injury= 40.0±17.5 years 15 children	ASIA A = 32.8% (75) ASIA B = 4.8% (11) ASIA C = 24.0% (55) ASIA D = 31.5% (72) ASIA E = 7.0% (7.4) Cervical = 62% T1-T10 = 15% (35)	Other: 0.9% (n=2) Blunt trauma: 6.1% (n=14) (not due to MVC,falls, diving,

Other					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
				T11-L4 = 19% (44)	gunshot wounds, or work-related)
Dahlberg et al. 2005 N=152	Helsinki, Finland	January 1, 1999 cross-section date Adult citizens (18 years or more) of Helsinki who had permanent sensory or motor deficits because of traumatic SCI (ASIA A–D). ASIA-E cases were excluded.	Males=76% Average age of injury=47.9 years	Data only for 121 subjects: 46% (n=56) tetraplegia 54% (n=65) paraplegia 57% (n=69) incomplete 43% (n=52) complete	Other: 9% (n=13)
Gur et al. 2005 N=539	South-eastern Anatolia, Turkey	1990-1999 4 hospitals that were major referral centers for trauma	Males = 77.2% Average age of injury=30.62 (1-70) years Civil servants: 22.6% (n=120) Housewives: 20.2% (n=109) Soldiers: 15.0% (n=79)	Incomplete paraplegia 29.3% (n=158) Complete paraplegia 45.1% (n=243) Incomplete tetraplegia 13.7% (n=74) Complete tetraplegia 13.9% (n=75) Cervical: 25.4% (n=137) Thoracic: 36.7% (n=198) Lumbar: 34.0% (n=183)	Other: 4.8% (n=26)
Lakhey et al. 2005 N=233	Dharan, Nepal	May 1997- April 2001 Orthopaedic ward of BP Koirala Institute of Health Sciences	Males = 72.5% <20years old =26 (11.1%), 20-30yrs =59 (25.3%), 31-40yrs =49 (21.0%), 41-50yrs =37 (15.9%), >50yrs =62 (26.6%);	Cervical = 88 (37.8%) Dorsal = 70 (30.0%) Lumbar = 72 (30.9%) None bony = 3 (1.3%) Complete = 46.8%	Carrying load on head: 4.7% (n=11) Other: 10.7% (n=25)
National Spinal Cord Injury Statistical Center 2005 N=23,683	USA	25 federally funded Model SCI Care Systems and National SCI Database	Males= 79.6% Average age of injury=37.6 years	Incomplete tetraplegia (34.5%) Complete tetraplegia (18.4%) Incomplete paraplegia (17.5%) Complete paraplegia (23.1%)	Other: 6.8% (n=161)
Catz et al. 2002	Israel	1959-1992	Males=75.6%	High cervical 7.6% low cervical 28.8%	Violence and Sports 10.4% (n=26)

Other					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
N=250		Traumatic SCI, admitted to the Loewenstein Rehabilitation Center, the major referral center for rehabilitation medicine in Israel.	Mean age = 34.5 years (range 6-83 years).	thoracic 32.4% lumbar 31.2%	
National Spinal Cord Injury Statistical Center 2000 N=19648	USA	24 federally funded Model SCI Care Systems and National SCI Database	Males = 81.7% 55% within 16-30 years old, mean age at injury is 31.8 years	Complete Tetraplegia = 18.5% Incomplete tetraplegia = 29.5% Complete Paraplegia = 27.9% Incomplete Paraplegia = 21.3%	Other: 7.9% (n=1552)
Caldana & Lucca 1998 N=127	Veneto, Italy	1994-1995 New cases of traumatic spinal cord injury and non-traumatic spinal cord disease treated in regional hospitals (small hospitals excluded)	Males = 83.5%; Average age (male) of 39.8 years Average age (female) of 36 years	Cervical=62 (21 complete) Thoracic = 29 (25 complete) Thoracolumbar (T12-L1)=18(11 complete) Caudal=14 (3complete) Unidentified=1	Other: 0.9% (n=5)
Martins et al. 1998 N= 398	Portugal	1989-1992 2 hospitals that treat all SCI in the central region of Portugal. Including deaths due to SCI and pediatric cases. Cases without neurological lesion, rehospitalization and vertebral lesions were excluded.	Males=77% Average age = 50.53±21.85 years	Complete n=220 Incomplete n=176 Deaths = 223	Other: 5.3% (n=21)
Chen et al. 1997 SCI=1,586	Taiwan	1992-1996 113 hospitals (11 medical centers, 50 regional general hospitals, 52 local general hospitals)	Males = 75.0% Average age of injury=46.1 years	Cervical 49.9% Thoracic 13.3% Lumbar 34.6% Died after treatment 6.6% (n=105)	Struck by object: 2.1% (n=33) Other: 4.7% (n=73)
Exner & Meinecke 1997 N= 22,212	Germany	1976-1996 All traumatic and non-traumatic SCI	72% male.	62% paraplegic 38% tetraplegic	Other: 12% (n=2,665)

Other					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
Otom et al. 1997 N=151	Jordan	1988-1993 Royal Jordanian Rehabilitation Centre (RJRC) King Hussein Medical Centre (KHMC)	Males = 85.4% Average age of injury=33 years	Cervical=31.8% (n=48) Thoraco-lumbar= 68.2% (n=103) Frankel A= 53.6% (n=81) Frankel B = 10% (n=15) Frankel C =22.5% (n=34) Frankel D= 13.9% (n=21)	Struck by object: 3.3% (n=5)
Karameh-metaglu 1995 N=152	Istanbul, Turkey	1992 New patients with traumatic SCI, including pediatrics.	Males = 75.7% Mean age = 33 years. 72% of patients were under 40.	Tetraplegic n=50 Paraplegic n=102	Struck by object: 7% (n=78)
Levi et al. 1995 N=353	Stockholm, Sweden	1991-1994 Survey of the regional Stockholm SCI population	Males=81% Average age of injury=31 (3-77) years	Cervical 41.6% (n=147) Thoracic 36.0% (n=127) Lumbar 14.7% (n=52) Sacral 1.4% (n=5) Complete 39.4% (n=139) Incomplete 59.5% (n=210)	Other: 7.9% (n=28)
Shingu et al. 1995 N=9752	Japan	1990-1992 Survey of nationwide institutions assumed to accept SCI patients. Exclusion criteria: Patients only receiving outpatient services in this period	Males=80.4% Mean age=48.6±19.1 (0.92-96) years.	Frankel levels: A=2518 (25.8%) B=1208 (12.4%) C=1984 (20.3%) D=1761 (18.1%) E=2242 (23.0%)	Struck by object: 5.5% (n=536)
Hart et al. 1994 N=616	South Africa	1988-1993 All records of SCI from the Natalspruit Spinal Rehabilitation Unit	Males= 80% Males between 15-40 made up the majority of patients	Complete n=404 Incomplete n=212 Cervical spine n=155 Upper thoracic n=135 Lower thoracic n=249 Lumbar spine n=74	Other: 5.6% (n=34)
Price et al. 1994 N=376	Oklahoma, USA	1988-1990 SCI cases in Oklahoma statewide multilevel	Males=80% 15-19 years =66 (18%) 20-29 years =110 (29%) 30-59 years	Complete tetraplegia=55 (15%), Incomplete tetraplegia =157 (42%)	Struck by object: 4.3% (n=16) Other: 4.0% (n=15)

Other					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
		surveillance system Exclusion Criteria: Non Oklahoma residents; patients who died at scene; injuries to nerve roots or spinal plexus.	=145 (39%) ≥60 years =43 (11%) Mortality=30 (8%)	Complete paraplegia=59 (16%), Incomplete paraplegia =105 (28%)	
Shingu et al. 1994 N=3465	Japan	1990 Survey of nationwide institutions assumed to accept SCI patients (residents); Exclusion criteria: Traumatic cervical syndrome cases and extradural nerve root	Mean age=47.8 years	Cervical=126 (60.3%) Below cervical=83 (39.7%)	Struck by object: 6.0% (n=208)
Acton et al. 1993 N=644	Arkansas, USA	1980-1989 Arkansas residents in Arkansas State Spinal Cord Commission registry. Exclusion Criteria: Lesions caused by degenerative disease; people who died at scene.	Males =80% Mean age males=32.4 years Mean age females=35.4 years	Tetraplegia=13 Paraplegia=19	Struck by object: 5.3% (n=34)
Dixon et al. 1993 N=164	New Zealand	1988 SCI cases in Health Services Statistics files.	Males=73.2% Males aged 15-29 years=46%	C1-C4=49 (30%) C5-C7=30 (18%) T1-T6=19 (12%) T7-T12-19 (12%)	Exertion/ Strain: 3.0% (n=5) Struck by object: 2.0% (n=3)
Tator et al. 1993 N=201	Toronto, Canada	1974-1981 First 220 admissions to Acute Spinal Cord Injury Unit in Toronto. Exclusion Criteria: Admissions >30 days after injury; spinal injuries without cord involvement; nerve root involvement only; penetrating	Males=79.6% Mean age=34.5 years Median age=27.0 years	Cervical=63.2%, Thoracic=16.9%, Thoraco-lumbar=19.9% Complete=46.2%, Incomplete=53.8%	Other: 10.5% (n=21)

Other					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
		injuries; injuries below L2; Patients who died on scene or upon arrival.			
Dincer et al. 1992 N=1,694	Turkey	1974-1985 SCI patients admitted to Ankara Rehabilitation Centre	Males = 75.7% Average age of injury=26.8 (1-70) years Agricultural workers= 19.8% (n=336) Housewives= 19.9% (n=338) Private industry workers = 19.5% (n=330)	Complete paraplegia 85.1% (n=1442) Incomplete paraplegia 6.9% (n=116) Complete tetraplegia 4.8% (n=82) Incomplete tetraplegia 3.2% (n=54)	Other: 11.10% (n=188)
Garcia-Reneses et al, 1991 N=1010	Spain	1984-1985 Every traumatic and non traumatic SCI patient in specialized Spanish hospitals	72.4% male. Mean age = 41.8 ± 1.2 years.	Sensory-motor incomplete SCI = 49% Complete SCI= 38%	Struck by Object: 3.2% (n=32) Other: 14.1% (n=142)
Biering-Sorensen et al. 1990 N=268	Kingdom of Denmark (Denmark, Greenland, Faroe Islands)	January 1975-December 1984 Admission to national specialized rehabilitation hospitals	Male=76.9% 40% within 15-24 years old	Cervical = 136 Thoracic = 76 Lumbar = 56 Complete tetraplegia = 22% Incomplete tetraplegia = 29% Complete paraplegia = 26% Incomplete paraplegia = 23%	Other: 1.0% (n=3) Struck by object: 3.0% (n=8) Crush accident: 2.0% (n=6)
Pedersen et al. 1989 N=27	Greenland	1965-1986 Admissions to rehabilitation hospital in Hornback with traumatic SCI; Patients injured in Greenland.	Males=74% Mean age=33.5 (14-50) years.	Struck by Object: Incomplete tetraplegia=1 Incomplete paraplegia=1	Struck by object: 7.4% (n=2) Gun accidents: 14.8%(n=4)
Ring et al. 1986 N=202	New South Wales, Australia	1977-1978 Admissions to New South Wales hospitals with spinal injury; death certificates that involved spinal injury. 99% of cases had	Males= 81% 15-24 years= 84 (42%) 25-44 years= 58 (29%) 45-64 years=30 (15%) ≥65 years= 15 (7%)	Glasgow Outcome Scale: Severe disability=98(49%) Moderate disability=19(9%) Good recovery=13(6%) Not recorded=3(1%)	Other: 9.4% (n=19)

Other					
Author Year N of study population	**Geographic region**	**Inclusion/ exclusion criteria**	**Study population**	**Injury features**	**Cause: %(n of cases)**
		neurological involvement.	Mortality= 69 (39%)		
Chen et al. 1985 N=560	Taipei, Taiwan	1978-1981 All record from general hospitals in Taipei. Included all spinal cord lesion with or without vertebral injury.	Males= 86% Mean age = 35.9 (range 20-49) years.	Incomplete Paraplegia n=118 Complete paraplegia n=180 Incomplete Tetraplegia n=117 Complete Tetraplegia n=145 Death n=31	Struck by object: 14.6% (n=82) Other: 5.6% (n=30)
Gee and Sinha 1982 N=36	Papua New Guinea	1978-1981 Traumatic injury Patients that stayed in Port Moresby, Lae and Manding hospitals	Males = 88% Mean age = 26years (range 16-41 years)	Cervical = 22% Upper thoracic = 11% Thoraco-lumbar = 28% Lumbar = 39%	Other: 13.9% (n=5)